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Report of the

WORKING PARTY ON THE PROMOTION OF FISHERY RESOURCES RESEARCH IN DEVELOPING COUNTRIES

Rapport du

GROUPE DE TRAVAIL SUR LA PROMOTION DE LA RECHERCHE SUR LES RESSOURCES HALIEUTIQUES DES PAYS EN DÉVELOPPEMENT

Informe del

GRUPO DE TRABAJO PARA LA PROMOCION DE LAS INVESTIGACIONES SOBRE RECURSOS PESQUEROS EN LOS PAISES EN DESARROLLO

Fløro, Norway, 2-8 September 1979
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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ORGANISATION DES NATIONS UNIES POUR L'ALIMENTATION ET L'AGRICULTURE
ORGANIZACION DE LAS NACIONES UNIDAS PARA LA AGRICULTURA Y LA ALIMENTACION

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ADVISORY COMMITTEE OF EXPERTS ON MARINE RESOURCES RESEARCH (ACMRR)
COMITE CONSULTATIF DES EXPERTS DE LA RECHERCHE SUR LES RESSOURCES DE LA MER (CCRRM)
COMITE ASESOR DE EXPERTOS SOBRE INVESTIGACIONES DE LOS RECURSOS MARINOS (CAIRM)

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Rome/Roma, 1981

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PREPARATION OF THIS REPORT

Because of the wild nature, high mobility and variability of fish resources, the information needs, and thus the research capacities required to secure them, are particularly high in the field of fishery development and management. At a time when coastal countries, both developed and developing, are acquiring an unprecedented authority over the rational utilization of almost all marine fish resources of the world and when the highest international authorities, e.g., the UN Conference on Science and Technology[1/], are showing a special concern for the strengthening of scientific capabilities in developing countries, the recommendation made by the Advisory Committee on Marine Resources Research at its 9th Session to review the fishery research means of developing countries, the existing institutional arrangements, the efficiency of exisitng programmes and strategies for providing assistance for the transfer of know-how, training and organization in fishery research, was particularly timely.

This report presents the conclusions and the recommendations made by a Working Party, set up by FAO in response to this initiative of ACMRR. This Working Party held two sessions: the first one in Svanøy, Norway, with the support of the Norwegian Agency for Development Cooperation (NORAD), the second at FAO Headquarters in Rome.

It is intended to aid agencies, both multilateral and bilateral, as well as national and international fisheries agencies and research institutions. It is hoped that its findings will contribute to the enhancement of fishery research programmes in developing countries and, especially, to the development of more effective aid strategies for the transfer of know-how, training and organization of fishery research.

A summary of the Working Party's main conclusions and recommendations is given at the beginning of the report.

[1/] Vienna, Austria, 1979

PREPARATION DU RAPPORT

Etant donné la nature sauvage, la grande mobilité et la variabilité qui caractérisent les ressources ichtyologiques, le développement et l'aménagement des pêches requièrent une masse particulièrement importante de renseignements, et donc des moyens de recherche au niveau de la tâche. En un moment où les pays côtiers, développés et en développement, acquièrent une souveraineté sans précédent sur l'utilisation rationnelle de la presque totalité des ressources ichtyologiques marines du globe, et où les plus hautes instances internationales, en l'occurence la Conférence des Nations Unies sur la science et la technique au service du développement[1/], s'intéressent tout spécialement au renforcement des capacités scientifiques dans les pays en développement, il était tout à fait opportun que le Comité consultatif d'experts de la recherche sur les ressources de la mer recommande, comme il l'a fait à sa neuvième session, que l'on étudie les moyens dont dispose la recherche halieutique dans les pays en développement, les arrangements institutionnels en vigueur, l'efficacité des programmes et stratégies en cours pour l'aide au transfert du savoir-faire, la formation et l'organisation de la recherche halieutique.

On trouvera dans le présent rapport les conclusions et recommandations d'un Groupe de travail créé par la FAO conformément à cette initiative du CCRRM. Ce Groupe de travail a tenu deux sessions: la première à Svanøy (Norvège), avel l'appui de l'Organisme norvégien pour le développement international (NORAD), la seconde au Siège de la FAO à Rome.

Ce rapport est destinée aux organismes d'assistance, tant multilatérale que bilatérale, aux organismes nationaux et internationaux des pêches et aux instituts de recherche halieutique. Les résultats qu'il contient devraient contribuer à renforcer les programmes de recherche halieutique dans les pays en développement et, en particulier, à promouvoir des stratégies d'assistance plus efficaces pour le transfert du savoir-faire, la formation et l'organisation de la recherche halieutique.

Un résumé des principales conclusions et recommandations du Groupe de travail figure au début du rapport.

[1/] Vienne (Autriche), août 1979

PREPARATIVOS PARA ESTE INFORME

Debido a su naturaleza silvestre, gran movilidad y variabilidad de los recursos ícticos, las necesidades informativas y, en consecuencia, las posibilidades de investigación necesarias para garantizarla, son extremadamente importantes en el sector del desarrollo y ordenación de la pesca. En un momento en que los países ribereños, desarrollados y en desarrollo, están adquiriendo una autoridad sin precedentes con respecto al aprovechamiento racional de casi todos los recursos ícticos marinos del mundo, y cuando las más altas autoridades internacionales, por ejemplo, la Conferencia de las Naciones Unidas sobre Ciencia y Tecnología[1], se muestran especialmente preocupadas por el reforzamiento de las posibilidades científicas en los países en desarrollo, es particularmente oportuna la recomendación hecha por el Comité Asesor sobre Investigaciones de los Recursos Marinos, en su novena reunión, para examinar los medios de investigación pesquera de los países en desarrollo, los acuerdos institucionales existentes, la eficiencia de los actuales programas y estrategias para facilitar ayuda para la transferencia de los conocimientos y la capacitación y organización de la investigación pesquera.

En este informe figuran las conclusiones y recomendaciones hechas por un Grupo de Trabajo instituido por la FAO en respuesta a esta iniciativa del CAIRM. Este Grupo de Trabajo celebró dos reuniones: la primera en Svanøy (Noruega) con ayuda del Organismo Noruego de Desarrollo Internacional (NORAD), y la segunda, en la Sede de la FAO en Roma.

Está destinado a los organismos de ayuda, multilaterales y bilaterales, así como a las instituciones de investigación y organismos de pesca nacionales e internacionales. Se espera que sus conclusiones contribuyan al reforzamiento de los programas de investigación pesquera en los países en desarrollo y, especialmente, a la elaboración de estrategias de ayuda más efectivas para la transferencia de los conocimientos, capacitación y organización de las investigaciones pesqueras.

Un resumen de las principales conclusiones y recomendaciones del Grupo de Trabajo figura al principio de este documento.

---

[1] Viena, Austria, agosto de 1979

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ABSTRACT

This report presents the conclusions and recommendations formulated by the ACMRR Working Party on the Promotion of Fisheries Resources Research in Developing Countries. In this field, the needs of those countries have increased considerably as a result of the new ocean regime which is giving coastal States considerably wider responsibilities over the control and management of the fisheries located off their respective shores.

The document reviews the conditions and factors likely to stimulate the strengthening of national research capabilities, notably the existence of long-term and comprehensive fisheries and research policies, of an effective administrative machinery - including an adequate institutional structure - as well as the allocation of appropriate resources and means. The importance of regional cooperation for adequately covering shared stocks and fisheries and for mobilizing the minimum mass of expertise, equipment and funds when those are not available at national level, is stressed.

From an evaluation of selected aid in research projects, the report analyzes the requirements for the provision of effective assistance, insisting on the fact that achievement of scientific maturity and self-reliance is a long-lasting endeavour. The document also reviews the FAO training programme and contains recommendations for its strengthening.

Finally, the Working Party recognized that the dissemination of scientific literature, within and among developing regions, has not received as yet adequate attention. Its report contains a number of proposals in this respect.

RESUME

Le présent rapport contient les conclusions et recommandations formulées par le Groupe de travail du CCRRM sur la promotion de la recherche sur les ressources halieutiques des pays en développement. Les besoins de ces pays dans ce domaine ont considérablement augmenté depuis que les nouvelles dispositions du droit de la mer ont donné aux Etats côtiers des responsabilités beaucoup plus étendues en matière de contrôle et d'aménagement des pêcheries situées au large de leurs côtes respectives.

Il passe en revue les conditions et les facteurs susceptibles de favoriser un renforcement des capacités nationales de recherche, en particulier l'existence de politiques globales et à long terme dans les domaines de la pêche et de la recherche, de mécanismes administratifs efficaces - notamment d'un cadre institutionnel adéquat - et l'affectation de ressources et de moyens appropriés. Le Groupe de travail souligne l'importance de la coopération régionale pour traiter de manière satisfaisante des pêcheries et des stocks partagés et mobiliser le minimum d'experts, d'équipement et de crédits nécessaires lorsque ces éléments ne sont pas disponibles au niveau national.

A partir d'une évaluation de quelques projets d'aide à la recherche, le rapport analyse les besoins en matière d'assistance, et met l'accent sur le fait que la maturité et l'autosuffisance scientifiques viennent au bout de longs efforts. Le document examine aussi le programme de formation de la FAO et contient des recommandations visant à son renforcement.

Enfin, le Groupe de travail constate que la diffusion de la documentation scientifique, à l'intérieur et entre les régions en développement ne bénéficie pas encore d'une attention suffisante. Le rapport contient plusieurs propositions à cet égard.

RESUMEN

En este informe figuran las conclusiones y recomendaciones formuladas por el Grupo de Trabajo del CAIRM sobre la Promoción de las Investigaciones de los Recursos Pesqueros en los Países en Desarrollo. En este sector, las necesidades de dichos países han aumentado considerablemente, como consecuencia del nuevo régimen oceánico, que está dando a los estados ribereños bastantes más responsabilidades con respecto al control y ordenación de las pesquerías situadas frente a sus respectivas costas.

En el documento se examinan las condiciones y factores que probablemente estimularán el reforzamiento de las posibilidades nacionales de investigación, especialmente la existencia de políticas pesqueras y de investigación globales y a largo plazo, de una efectiva maquinaria administrativa - con inclusión de una estructura institucional apropiada - así como la asignación de suficientes recursos y medios. Se pone de relieve la importancia de la cooperación regional para ocuparse convenientemente de las poblaciones y pesquerías compartidas y para movilizar la mínima masa de experiencia, equipos y fondos, cuando no se encuentran a nivel nacional.

A partir de una evaluación de determinada ayuda para proyectos de investigación, el informe analiza las necesidades en cuanto a la facilitación de existencia efectiva, insistiendo en el hecho de que lograr la madurez científica y la autoconfianza es una empresa duradera. En el documento también se examina el programa de capacitación de la FAO, y en él figuran recomendaciones para su reforzamiento.

Por último, el Grupo de Trabajo admitió que la difusión de la literatura científica, dentro y entre las regiones en desarrollo, aún no ha recibido suficiente atención. Su informe contiene varias propuestas al respecto.

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SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Fishery Research Requirements at National Level

The Working Party concluded that, in the developing countries as a whole, means and funds available for fishery research were generally insufficient, quantitatively and qualitatively (para. 35). This situation has become more critical as a result of the change in the ocean regime which has increased the responsibilities of all coastal States and, thus, the research requirements especially of developing countries.

The first condition to ensure satisfactory development of national research capacities is the existence of long-term, comprehensive fishery and research policies (para. 62). This requires clarification of objectives and determination of priorities in the relevant fields. These needs, together with the specific features of tropical fisheries and the research environment in developing countries, have, in turn, important consequences on the applicability of approaches and programmes of fishery resource research in them (paras. 17-23). Although the scope and details of national research programmes will depend on such factors as the economic importance of national fisheries or the size of national economies, the development and effective establishment of statistical systems adequate for assessing and monitoring national fisheries is a priority task in any country (para. 19).

It was also recognized that the development of research capabilities depended upon the existence of effective administrative capacities (para. 81) and on an institutional structure (paras. 38-44) able to ensure appropriate support and communications, in particular with respect to the use of research. To facilitate the two-way flow of information between research and administration, the Working Party was of the opinion that the research unit should preferably be administratively located within, or close to, the national fisheries directorate (para. 38).

It was recognized that a scarcity of financial resources in developing countries often resulted in an allocation of resources for science and technology far below the level required to achieve the desired level (paras. 8, 49 and 57). To mobilize the expertise - in scope and number - needed to ensure a coherent development and rational utilization of the fishery resources, manpower analysis and long-term planning are important (para. 36). To secure adequate supply of suitable manpower, national scientists and technicians should enjoy working conditions comparable to those offered in alternative research and academic departments (para. 49). With respect to research vessels which are expensive, not only to acquire but also to run and to maintain, the Working Party recommended that countries carefully assess their capacity to meet such expenses before taking the decision to acquire such vessels - even if these are to be provided free of charge (paras. 74, 75).

Regional Cooperation

The Working Party recalled that regional cooperation is particularly important in fishery resources research. This was for two reasons: firstly, because this is the only possible approach to assess and monitor stocks which are distributed and move across man-drawn boundaries; secondly, because it can provide an answer to the difficulties met by countries in mobilizing separately the critical mass of expertise, funds and equipment (e.g., research vessels, computers, etc.) (para 53). In this respect, the role of regional fisheries bodies, especially those that FAO has established in most tropical areas, is particularly important. They provide a mechanism for member countries to promote and organize their regional cooperation (paras. 44-46). For example, the Working Party emphasized that participation in working parties, seminars and other regional activities was in general the most efficient way for junior scientists to acquire full mastership of their disciplines to keep abreast with new methodological developments (para. 45).

To fully develop the opportunities offered by technical cooperation (TCDC), notably at bilateral level, developing countries need more funds, especially in foreign currencies (para. 46). Pointing out the present deficiencies in the publication and dissemination of scientific literature in developing regions, regional fishery bodies and programmes as well as aid agencies should consider, as a matter of urgency, the possibility of establishing and supporting regional scientific journals, documentation centres and loan libraries (paras. 23, 54).

Aid in Research Projects

On the basis of the evaluations made on the performances achieved in the past by selected aid projects, the Working Party concluded that the primary condition for such projects to be successful was that they be conceived as integral elements of long-term and comprehensive development strategies (para. 62). National administrations should have the prime responsibility in developing and implementing such strategies.

The qualifications of expatriate and national experts associated with field projects - and in particular project managers - were a major factor in determining the success of aid in research projects (paras. 70-73, 95). The difficulty frequently met by FAO in recruiting field scientists with a good level of expertise was noted. It was hoped that FAO, together with national administrations, could work out procedures and conditions which would facilitate the temporary release of civil servants (para. 70).

It was further noted that most aid in research projects has basically two objectives: (i) the conduct of a given research programme and (ii) the strengthening of national research capabilities. It was pointed out that for such aid to have noticeable impact, the time requirement is appreciably longer with respect to the second objective, especially when the project is aiming at building up national research institutions. This difference in the time requirement has often not been properly recognized when formulating projects, a practice which has resulted in too little funds and time commitments (para. 63). To attain scientific maturity and self-reliance, young institutions need frequent assistance (visits of specialized foreign experts, fellowships for their junior scientists in advanced laboratories, etc.) for a period which usually exceeds the average duration of current projects (paras. 77, 78). The Working Party recommended that FAO and aid agencies, such as UNDP, give proper attention to this need.

The Working Party also felt that twinning arrangements between properly selected advanced institutions and research laboratories in developing countries represented a very effective approach to providing technical assistance in fishery research and institution-building. It expressed the hope that FAO and other international organizations could overcome the administrative difficulties which still prevent more frequent recourse being made to that form of aid (paras. 83, 84).

The establishment by FAO of new regional field programmes was welcomed. This kind of project has demonstrated its value for providing technical support to activities of regional fishery bodies (paras. 10, 69); for promoting TCDC notably by accelerating contacts, joint investigations (para. 90), common interpretation of research findings (para. 53) among regions' research institutions and individual experts; and for facilitating training activities in highly specialized fields (paras. 50, 96, 97). The Working Party expressed the hope that additional resources could be mobilized to extend the geographical coverage and scope of activities of such projects (paras. 90, 91).

The scientific skills and institutions available in each region should also be used as much as possible to fully utilize their first-hand experience of the regions' conditions and give them opportunities for development (paras. 90, 92). Noting the many similarities between the activities conducted under the FAO Regular Programme and those financed by the UNDP Interregional and Global Programmes, and the long experience acquired by FAO in most of the fields covered, proper coordination should be maintained when formulating and carrying out those activities (para. 84).

Training

The Working Party carefully reviewed and assessed the activities conducted by the Fishery Resources Division in this field and recognized the important role played by the FAO training courses and manuals on fishery science (paras. 99-109). It recommended that the FAO series of manuals be kept separate, comprehensive and up-to-date (para. 100) and that an editorial board be established to that effect (para. 101). It further emphasized that, in delivering its programme, FAO should give adequate attention to the training of trainers (paras. 98, 106).

Dissemination of Scientific Literature

Finally, the question of the dissemination of scientific literature was considered. An increased effort should be devoted to translations (para. 103) and distribution (para. 102) of FAO documents. Many developing countries still do not have the documentation and library facilities which condition the full utilization of the services provided by the ASFA[1/] and ASFIS[2/] programmes. Therefore, the specific needs of, and conditions prevailing in, developing countries should be fully taken into consideration when developing further and executing these programmes (para. 114).

1/ Aquatic Sciences and Fishery Abstracts

2/ Aquatic Sciences and Fisheries Information System

1. INTRODUCTION

1. At its 9th Session, ACMRR recommended that FAO establish under ACMRR a "Working Party on the Promotion of Fishery Resources Research in Developing Countries" with the following terms of reference:

(i) Arrange for the analyses to be made of a selection of development assistance projects in resources research, establishment of research institutions and various forms of training schemes and activities with a view to evaluating the efficiency and effectiveness of various approaches and policies;

(ii) Consider the main features of systems of organizing and planning fishery resource research with special emphasis on a full utilization of scarce facilities for research;

(iii) Consider institutional arrangements for international cooperation in research, particularly within the framework of regional organizations, e.g., fishery commissions;

(iv) Develop sets of strategies and tactics for development assistance in fishery research involving the transfer of technology, training and organization, and covering bilateral programmes between developed and developing countries, those of international organizations and cooperation between developing countries.

Members of the Working Party are listed in Annex 1.

2. Following a request from FAO, the Norwegian Agency for Development Cooperation (NORAD) offered to bear the cost of the first session which was held at the Svanøy Foundation, near Florø, Norway from 2 to 8 September 1979. The list of documents prepared on that occasion is presented in Annex 2.

3. The following agenda was adopted by the first session:

(1) Consideration of terms of reference;

(2) The objectives of fishery resources research with special reference to developing regions;

(3) The theories, methods and equipment basis of fishery resources research with special reference to conditions in developing countries and technology transfer;

(4) The organization at national, regional and international levels of fishery resources research;

(5) Some experiences of results of aid in fishery resources research:

  (a) research projects,

  (b) institute-building projects,

  (c) training and education;

(6) Resources needs for fishery resources research (costs, equipment, manpower);

(7) Planning of the future activities of the Working Party.

An interim report was prepared on that occasion.

4. A number of factors associated with the problems of fishery resources research in developing countries were outlined at this session. Many of these problems could however not be adequately discussed or evaluated without an indepth analysis of:

(i) The state of current resources research in developing countries;

(ii) The past UN and bilateral training programmes;

(iii) The contribution of aid projects to fishery research capabilities, and

(iv) The present capacity in developing countries to train graduates and post-graduates in marine sciences (including fisheries science).

5. The Working Party also noted that its effort would be enhanced by an evaluation of the UN Conference on Science and Technology (held in Vienna, Austria, 20-31 August 1979) as well as of the role of the FAO regional fishery bodies and aid programmes in the support and promotion of fishery resource research in developing countries. The session therefore decided that background papers on the following topics should be prepared to form the basis of discussion for the second session:

(i) An assessment of the current state of resource research in developing countries;

(ii) A critical review of UN/FAO and selected bilateral fishery training courses and centres;

(iii) The impact of selected UN and bilateral fishery aid projects on national competence in the field of fishery resources research in developing countries;

(iv) The availability of graduate and post-graduate training in developing countries in the field of marine science - including statistics;

(v) An evaluation of the recommendations of the UN Conference on Science and Technology;

(vi) The role of FAO regional bodies and associated regional field projects and programmes in the support and promotion of fishery resources research in developing countries.

The list of documents prepared for the second session is given in Annex 3.

6. The second session of the Working Party was held at FAO, Rome, from 8 to 12 September 1980. The agenda adopted for the second session is given in Annex 4.

7. Discussions of the session were centred on updating the assessment of the state of fishery resources research in developing countries, impact of aid projects (bilateral, multilateral and intercountry) and improvements to be made in aid programmes with information gathered during the intersessional period.

8. This was done in the context of some of the recommendations made by the UN Conference on Science and Technology (Vienna, Austria, August 1979, see Annex 10). Most important among these was the recognition of the fact that scarcity of financial resources in developing countries often results in a resource allocation for science and technology far below the critical level required to achieve the desired effect, and of the urgent need to establish mechanisms to augment the quantum and to improve conditions for the transfer of financial resources for science and technology to developing countries. While acknowledging the extreme importance of funding, the Working Party noted that the science and technology policies of the recipient countries are the determining factors ultimately. Accordingly, they should be seen as a necessary condition for international and regional scientific cooperation. This implies a proper setting of priorities and long-term planning.

9. On the question of institutionalization of science and technology, the general view was that developing countries should ensure compatibility and coordination of the different components of the science and technology system (users and producers of science and technology). Consequently, it was recommended that bodies responsible for science and technology policy should have close working relationships with the authorities managing and planning social and economic development, so as to ensure the integration of science and technology in development programmes and to prevent science and technology activites from being isolated from, or out of step with, other national development objectives.

10. In this regard, the Conference recommended that development research cooperation should not be conceived in sectoral terms but should take fully into account the main interactions that a well conceived development process triggers among related sectors within the national set-up and regionally. The Working Party welcomed these recommendations and expressed the hope that they would be followed by practical steps in future cooperative research.

11. The interim report prepared at the first session was amended and complemented, wherever necessary, to fully reflect the conclusions and recommendations reached at the end of the second session. The present document, thus, supersedes the interim report.

12. A selection of the most interesting contributions prepared for the sessions of the Working Party was made. The contributions thus selected are presented in Annexes 5-14.

2. THE OBJECTIVES OF FISHERY RESOURCES RESEARCH WITH SPECIAL REFERENCE TO DEVELOPING REGIONS

13. If formulated in a general manner - e.g., the acquisition of qualitative and quantitative information on the resources and their geographical and temporal distribution - the objectives of fishery resource research would seem to be independent of the characteristics of the resources, the conditions for conducting research and the objectives of the community. Discussions on this point revealed, however, considerable doubts as regards the general validity of more specific objectives of fishery resources research. These may be dependent on the three conditions mentioned above, viz., the resource characteristics, the conditions for and the role of research, and the community objectives. Especially at a developing stage, the role of a scientist is not restricted to a technocratic provision of objective information but will also include that of influencing the formulation of community objectives.

14. Research objectives from highly industrialized fisheries regions might thus be introduced into areas where they may not be appropriate. For example, the widely applied objective of "determining the maximum sustainable yield" of a resource should be used with great caution, because experience has shown it to be largely unsuitable as a single management objective. The problem in a developing country may, for instance, be how to make fuller use of resources which are already partly exploited by an artisanal fishery. A simple production model may provide important information with regard to the characteristics of potential yields of a resource but, by itself, will not provide the full range of information required to make intelligent management decisions regarding, for example, resource utilization by the various possible users of the resource. The objectives of research must obviously include a quantitative assessment, but this could take the form of an estimate of the surplus yield available for harvest under the current conditions of the resource, the fisheries characteristics, and the goals for resource utilization.

15. Research objectives and priorities should, in particular, be adjusted to the community objectives, such as studies on the availability, catchability and quality of the resources, may have to be given high priority in an initial phase of fishery development.

3. THE THEORIES, METHODS AND EQUIPMENT BASIS OF FISHERY RESOURCES RESEARCH WITH SPECIAL REFERENCE TO CONDITIONS IN DEVELOPING COUNTRIES AND TECHNOLOGY TRANSFER

16. Methods of fishery resources research have been largely developed in temperate regions and this is also where they have been most intensively and widely applied. Therefore, the question of their applicability in tropical and sub-tropical regions where most of the

developing countries are found is highly relevant. The subject was discussed by the Working Party with reference to both the different characteristics of the resources, the basis of their production in tropical waters and the different conditions for research which most often prevail in situations of early economic, administrative and technological development. Main features of resource characteristics which differ from temperate regions are:

- a high turnover rate of production and shorter life-span of many species;
- resources must in many cases be assessed, exploited and managed as units consisting of several or a large number of different species;
- reproduction, which generally covers a wider range, in time and space, than in temperate regions;
- growth characteristics with seasonal cycles of low amplitude.

17. In addition, resource data which can be derived from fisheries may be particularly difficult to obtain (e.g., small-scale and artisanal fisheries with a great many units, early development of the national administrative set-up) and, therefore, may be less meaningful than the data collected from more organized fisheries. A part of the resources in some developing regions is unexploited and fishery statistics thus absent. Also, the concentration of research effort on a few selected species has left largely undocumented a substantial proportion of the resources, especially the accessory catches and the discarded species. This is detrimental to the sound assessment and monitoring of exploited and latent fish resources. There is also a general lack of economic and social (manpower) data.

18. This situation is particularly unsatisfactory because, even in countries with limited research capacity, extremely valuable information can be collected from the existing fisheries. This is far from being properly recognized by governments and the inadequacy in coverage, detail and reliability - of national statistics remains one of the important restraints to making a reliable diagnosis of the state of the stocks.

19. Therefore, whatever means individual countries can devote to their fishery research, they all should introduce and firmly establish adequate systems for the routine collection and storing of fishery statistics. Such statistics should include catch and effort data by main fisheries and, as far as required and possible, information on the species and size composition of the catches. Whereas the design of the required sampling system, and its periodic upgrading, may require short-term contributions from outside specialists, its routine operation should not require much more than the recruitment and financing of enumerators in adequate numbers and qualifications. This would ensure, for each country, that the basic information, necessary to periodically review the state of the stocks and of the fisheries they support and to provide national administrations and the industry with adequate advice for their management, is available.

20. The consequences, in terms of scientific approach and applicability, of the specific features of tropical fisheries and of the operational conditions for research prevailing in developing countries are considerable. The single-species approach so widely applied in temperate fisheries can only be used selectively. Because of the short life-span and problems of age determination, analytical models have a limited applicability without special adjustments. Simplified overall production models should also be adapted and applied. In stocks with significant year-to-year fluctuations in production, biomass monitoring through surveys may be the only means of securing meaningful information for management. Egg and larval surveys will generally not be used, but fishing surveys and combined acoustic/fishing surveys will often be indispensible for providing total biomass estimates from which potential yields can be derived. Use may often also be made of all available information on oceanographical conditions and primary and secondary productivity to deduce comparative indices of stock productivity.

21. It was also noted that there is a need to develop methods and techniques appropriate for tropical resource studies, e.g., age reading by day-zones, statistical sampling systems for artisanal fisheries, adaptation of acoustic survey techniques to tropical conditions,

development of productivity indices by kinds of fish communities and environments, etc. Because of the scarcity of resources for reseach and the difficult working conditions, the technology and its equipment basis should often be kept as simple as possible. Relatively straightforward fishing surveys, if well designed and executed, can provide a great deal of essential information.

22. Because of the short-time series available on fish resources characteristics in tropical waters, there is also little information available on central problems of general interest for management of such resources, e.g., the long-term stock fluctuations and the stock-recruitment relationships, the resilience of stocks under fishing pressure, the inter-actions between stocks, etc. This makes management decisions more difficult for these resources and a higher degree of caution may be advisable. As science develops and spreads, systematic attention to these research problems should soon improve our state of knowledge. To ensure the best opportunities for this process, consideration should be given to the organization of special reviews of issues and studies of tropical and sub-tropical fish resources.

23. The Working Party also noted that, in addition to the fact that fishery resources research in many developing countries has been poorly developed, the results of the research which has been carried out are often poorly disseminated and known. This is mainly because of scarce opportunities of publication of investigations' findings from such areas. The Fisheries Department of FAO should look into the possibility of establishing regional scientific bulletins to promote dissemination of research results in such areas.

4. CURRENT STATE OF FISHERY RESOURCES RESEARCH IN DEVELOPING COUNTRIES

4.1 Survey in Selected Countries

24. At its first meeting, the Working Party decided that a study should be undertaken to provide information on the numbers of fishery scientists in developing countries, the level of their formal education and training, the scope of capabilities (available scientific disciplines), the available funds and facilities (including research vessels), the institutional setting within the government or organization, its ties with the users of research findings and the total financial commitment for fishery research (resource evaluation) versus the ex-vessel value of fisheries resources harvested. It was recognized that a comprehensive study of this type could not be prepared for all developing countries in the time available and, therefore, it would have to be tailored to a selected number of fishing countries in Africa, Latin America and Asia.

25. The study was undertaken by the FAO Secretariat by means of a questionnaire. The coverage of the survey was unfortunately far from comprehensive but some of its findings were thought to provide useful and interesting information.

Replies were received from the following countries:

Africa: Algeria, Ivory Coast, Ghana, Mozambique, Mauritania, Morocco, Senegal, Sierra Leone, Tanzania, Seychelles,

Asia: India, Malaysia, Philippines, People's Democratic Republic of Yemen.

Latin America: Uruguay, Argentina, Colombia, Cuba, Ecuador, Jamaica,

Oceania: New Guinea,

Mediterranean: Cyprus[1/],

i.e., in total 22 developing countries.

Institutional arrangements

26. These were usually described in some detail, but for the purpose of this analysis two basic models were considered, viz.: internal, where the research unit forms part of the

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[1/] plus Algeria, Morocco mentioned under Africa fisheries administration, and external, where the research is the responsibility of some other institution, e.g., the university, research council, etc.

27. The distribution of answers was as follow:

	Internal	External
Africa	7	3
Asia	2	1
Latin America	6	0

Opportunities for university-level training in national institutions

28. The number of national institutions offering basic training at the university level for fishery scientists was reported to be:

in the African reporting countries, 10
in the Asian reporting countries, 11
in the Latin American reporting countries, 13

The location - either at home or abroad - where professionals recruited to the fishery research institutions received their formal university training was (in number of scientists) as follows:

	National	Foreign	Ratio N/F
Africa	27	57	0.5
Asia	221	10	22
Latin America	217	22	10

Manpower

29. The number of scientists by specialization and of technicians was as follows (mean per region):

	Resource biologists	Environment and pollution experts	Others	Total	Technicians
Africa	6.5(58%)	3.4(30%)	1.5(12%)	11.2(100%)	10
Asia	83(62%)	28(21%)	22(17%)	134(100%)	117
Latin America	30(60%)	10(20%)	10(20%)	50(100%)	32

Research costs

30. The total cost of research, as percentage of the first-hand value of catch, was:

	Range (%)	Mean (%)
Africa	0.3-2.5	1.0
Asia	0.1-3.0	1.0
Latin America	0.5-3.0	2.0

Comments

31. Before commenting on these statistics, it was noted that the above figures were not directly comparable. They were influenced by a large number of factors. For instance, independently of the size of national fisheries or the level of general economic development of the country, large countries such as India could be expected to be able to cover a broader range of disciplines. In that respect the summary statistics reported for Asia largely reflect the situation in large countries and not as accurately in smaller countries of the same continent. As such, they cannot be directly compared to the figures for Africa where reporting countries were in general geographically and economically smaller.

32. Despite their limitations, the survey data indicate that in more than three quarters of the countries covered the fishery resources research is primarily the responsibility of a special institution forming part of the national fishery administration. Only in some of the reporting countries in the African and Asian regions does the research unit form part of a more general research council or other similar body.

33. In all regions a not inconsiderable number of academic institutions offering training in fields of relevance to fishery science exists in the countries covered by the survey. Similarly, the records given of the origin of professional training of the personnel recruited to the research institutions show that the available training capacities are made use of. There is, however, a considerable difference between the regions, with reporting countries of Africa having only about one third of their professionals receiving their basic training in national institutions while, in Asia and Latin America, the proportion is 90 percent or more.

34. With respect to the number of scientists reported as being engaged in fisheries resources research, there is also a clear difference between regions. On a country basis, the numbers are perhaps not very meaningful since countries of widely different sizes are included, but there is an indication of scarcity of scientists in African countries as compared to those of Asia and Latin America. The proportion between the various categories listed indicate a reasonable priority between disciplines.

35. The research costs, as part of the estimated first-hand value of landings, show a wide range between countries from 0.1 to 3.0 percent. A similar estimate from the Northeast Atlantic based on a survey in 1974[1/] showed a range from 0.5 to 3.7 with a mean of 2 percent for nine West European countries. This may be compared with a mean of 1 percent for the African and Asian countries and 2 percent for the Latin American countries. However, most developing countries would have relatively more potential for fishery development and, thus, the value of their fishery resources is probably underestimated by the first-hand value of their present catch. If it is assumed that the Northeast Atlantic countries have an appropriate level of expenditure on resources research, one may then conclude that in general the expenditure on the part of the developing countries covered by the survey is insufficient.

36. The Working Party concluded that the study had provided some information on the subject. Efforts, however, should be made to obtain more comprehensive and representative data since such evaluations can give important guidelines for deciding on policies and priorities.

4.2 Organization at National Level

37. The Working Party looked, in more detail, at the institutional location of resource research in relation to the government organization responsible for the formulation and implementation of policy on fisheries development and management. As shown by the study referred to above, in a majority of countries fisheries research is done in a section, department or institute which is an integral part of the department that formulates and executes the fishery policy, with the Director of Research directly responsible to the administrative head of the Fisheries Department. In some countries the research is located in a laboratory or institute which is part of a larger research organization usually covering the whole agricultural sector. In others, the fisheries resources research is part of a national research organization (or possibly ministry) whose competence extends over many sectors of the economy. In several countries university departments participate in investigations on fishery resources.

38. It was considered that the two-way flow of information between fishery scientists and fishery administrators is greatly facilitated by the closest possible institutional relationships between fisheries resource research and fishery administration and, therefore, the

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[1/] Saetersdal, G., A note on the state of fishery research in the Northeast Atlantic. In
1975 Suppl.1 to the Report of the Eighth Session of the ACMRR, Sesimbra, Portugal. 8-12 September 1975. FAO Fish.Rep.(171) Suppl.1:136

location of the resource research within the government fisheries department was favoured. Such arrangement also facilitates the development and firm establishment of efficient statistical systems. As fishery scientists are the main users of the fishery statistics, they are able to contribute in the design of the sampling schemes and to help in the training of field enumerators. Finally, such arrangements facilitate the use by fishery scientists of the provincial network of the Department of Fisheries to maintain contact with the fishery sector and become personally fully informed about changes in the fishing practices which could affect, for instance, the efficiency of fishing operations and consequently the estimation of fishing effort.

39. There were historical reasons for the particular location of fisheries research in each country but, on balance, whether the country was large or small and irrespective of the importance of the fisheries resources, close links between the resource research and the fisheries administration help to ensure that future policy would be guided by sound information and advice. This would be particularly important as more resources became fully exploited and more fisheries come under active management. Whatever solution would be adopted for the formal institutional set up, appropriate connections should be established to ensure adequate communications with the fishery or research administration outside the formal set-up; this could be done, for example, through the establishment of permanent advisory committees.

40. In any case, the Working Party stressed that, however close these links were, it was essential that the research institute maintained its autonomy in scientific matters and with relation to its internal operations. Indeed, an adequate autonomy for developing its long-term research programmes conditions the ability of the fishery research institutions to provide administrators, entrepreneurs and fishermen with the scientific advice on which coherent development and long-term management plans can be built up.

41. Although this location of the research unit inside the fisheries administration is considered to be generally advantageous, it may in some cases have unfavourable side effects. Such organizational structure may, for instance, result in a structure where professionals of the research unit are offered poorer conditions than in other research institutions in the country, e.g., in universities. This has in a number of cases adversely affected the recruitment and retaining of good scientists. The conditions of work in government laboratories need to be such that they are capable of competing on equal terms with universities and other national institutions for the appropriate scientific staff.

42. Active cooperation should be maintained between the fisheries research laboratories and university departments involved in all related fields of research. This would assist in ensuring that the teaching of fisheries topics in the university was appropriate and related to the national fisheries needs and the current state of the science. Fisheries scientists can usefully take part in lecturing and teaching at undergraduate and graduate levels. Also, close contacts between the two can assist the university doing research, which is also of use in the understanding of the fishery resources of the country.

43. In addition to close contact with institutions working within the same disciplines, contact with units of other relevant disciplines should also be maintained, e.g., fishing technology and fish processing technology, human nutrition, social sciences, economics. The organizational structure and arrangements should be such as to facilitate these kinds of contacts.

4.3 Regional Arrangements and Technical Cooperation Among Developing Countries

44. Regional fishery bodies have provided their member countries with an essential mechanism to tackle issues raised by the exploitation of international and shared stocks, especially the promotion and coordination of resources evaluation studies and the formulation and negotiation of management schemes. In this respect the Working Party noted that the fishery bodies set up by FAO in most tropical and sub-tropical areas were playing a growing role as the scientific capabilities of its member countries increase (Annex 6). It welcomed the

establishment by FAO of regional field programmes, with the support of UNDP and other multilateral and bilateral donors, to serve as a technical support unit of such regional fishery bodies. Although the role of regional fishery bodies is being affected by the current change in the ocean regime, it will remain essential in regions where the number of shared stocks is high, e.g., for the compilation and exchange of fishery statistics, the organization of joint working groups for the evaluation of stocks and the analysis and formulation of possible management schemes.

45. These regional bodies will remain extremely useful in all regions for facilitating and promoting regional cooperation, in particular among developing countries. Participation of junior scientists in regional working parties appears to be one of the most efficient ways of effecting their training. By facilitating exchange of views and experiences, critical examination of research investigations by the scientific community, selection of research priorities and the sharing of research programmes, regional collaboration appeared to the Working Party to be the most efficient approach to ensure continuous upgrading of national expertise. It was considered that this should be continued and strengthened.

46. The Working Party also stressed the value of scientific and technical cooperation among developing countries for promoting the use and development of their own expertise and institutions. Although regional fisheries and economic bodies can be an efficient instrument in promoting these activities, developing countries have also various opportunities to develop their collaboration directly. In this context, several examples of bilateral cooperation in the field of fishery research were given, e.g., Cuba/Guyana, Cuba/Mexico, Indonesia/Thailand, Indonesia/Malaysia, Ivory Coast/Ghana, etc. However, full use of TCDC opportunities is often hampered by the lack of funds, especially in foreign currencies. It was considered important that adequate funds be committed by developing countries themselves, including from nationally managed multilateral and bilateral budgets.

5. RESOURCES NEEDED FOR FISHERY RESEARCH

5.1 Manpower

47. The Working Party discussed the question of manpower requirements necessary for implementing fishery resource research programmes and considered that there was a minimum number of "critical mass" without which purposeful resource research and the giving of sound advice on development and management measures would not be possible. With the diversity of species in tropical ecosystems, and the variety of questions to be answered, it was considered that the minimum number for undertaking independently relatively comprehensive fishery research programmes was some seven to ten scientists and, among these, their quality as research workers was more important than their numbers.

48. In many of the smaller countries, as well as those with relatively limited fishery resources, the number of scientists is likely to be small and here participation in regionally organized working parties, workshops and other activities was particularly important to help increase their knowledge, competence and effectiveness.

49. In certain countries the recruitment and selection of scientists of adequate quality was causing a real problem. This was due to the disparity in the pay structure and conditions of work in Fisheries Departments vis-à-vis those in universities and sometimes even in other government departments such as agriculture and animal husbandry, as well as in the private sector. In order to ensure an adequate supply of suitable manpower, the Working Party recommended that parity - which covers conditions of service such as some freedom to pursue research interests (within area of responsibility) as well as salary - in this regard should be ensured.

50. In the development of manpower programmes, it is necessary to include not only scientists but also personnel required for the operation of research vessels and the shore facilities for the maintenance of the vessels as well as for the use of sophisticated equipment such as acoustic apparatus and computers. The need for support of the FAO in such programmes was emphasized. Because a regional approach is often necessary in organizing training

activities in highly specialized fields (fishery statistics, stock assessment, surveys, fishery management, aquaculture, etc.), the Working Party felt that the FAO regional projects have a major responsibility in the selection and preparation of such courses, as well as in the marshalling of funds to finance them.

5.2 Equipment

51. While some marine research requires highly sophisticated equipment, the Working Party noted that a great deal of extremely useful work for the assessment of resources could be done with very little equipment, using statistics from commercial fisheries and length and other observations on the fish which can be obtained, without research vessels, at markets and on commercial fishing vessels. Such work requires little more than measuring boards, a microscope and calculating machines. However, where the resources are extensive and where the collection of comprehensive fishery statistics is encountering serious shortcomings which cannot be rapidly overcome, the use of research vessels becomes essential.

52. Even computers, which are more and more necessary for the processing of large amounts of raw data, are becoming available at reasonable prices and the development in desk computers makes it now possible for many fishery institutes in developing countries to acquire their own equipment. This was considered important by the Working Party to reduce delays in data processing and to familiarize fishery scientists with the use of such equipment.

53. Where the assessment of pelagic resources requires the use of sophisticated acoustic equipment but the country is not able to afford or maintain such equipment, cooperative programmes with countries possessing such equipment and the expertise required for their utilization should be sought to meet this need.

54. It was finally observed that, in a number of developing countries, the library facilities for fishery resources research studies is in a deplorable state or does not even exist. This renders very difficult the growth of fishery research. Each fishery research centre must have a core library of books, manuals and research journals on fisheries. In addition, up-to-date scientific literature on systematics, including keys for identification of fish species and all aspects of studies relating to biology of resources, particularly those relating to the area or region with which the country is concerned as well as on the basic methods for resource assessment, is essential for ready reference.

5.3 Costs and Funding

55. The Working Party recognized the fact that costs in fishery resources research are highly variable. While research vessels are expensive, their running costs also are very high, making it difficult particularly for the smaller countries to make full use of them even if vessels are given as gifts under aid programmes. When a donor country provides expensive capital equipment, such as a research vessel, it should make available additional funds toward its maintenance for an appropriate number of years. The Working Party also recommended that the possibility of developing research vessel facilities on a regional basis should be examined.

56. The information on funding contained in the contributed papers and background documents was examined. It was recognized that the inadequacy of funds was becoming a major constraint on resource research in most developing countries. Examples were given of countries or regions where positive progress, which had been achieved partly as a result of outside support (national or regional aid projects), deteriorated once outside financing had ceased.

57. There was an urgent need for developing countries to increase the amount and quality of resource research. If this was to be achieved, governments must recognize that substantial increases in funding would be required. It would be useful were the fishing industry to contribute to resource research but the Working Party stressed that it was essential that such funding should be via the government and not directly to the institute concerned and that the result of the research should be made generally available.

6. AID PROJECTS IN FISHERY RESOURCES RESEARCH

58. The Working Party reviewed the achievements, obstacles and drawbacks of research and training projects in the light of the analyses conducted during the inter-sessional period. Performances of aid projects, both bilateral and multilateral, in 11 countries (Annexes 5, 8, 11, 12, 13) have been analysed by people who have been closely associated with the recipient countries as well as with the aid organizations. In reviewing this subject, the group felt that it should discuss separately national and intercountry projects but that there was no need for assessing the bilaterally funded projects apart from those financed from multilateral sources as their requirements and constraints were similar.

6.1 National Projects

6.1.1 Project formulation and planning

59. In their basic philosophy most research projects have been designed to cover two major components: (i) the execution of a certain research programme and (ii) the training of national research personnel. The relative emphasis given to these two aspects varied from project to project but, in general, more immediate attention has been given to item (i).

60. Generally speaking, there was good agreement among the various assessments contained in the contributions submitted to the Working Party on the performances achieved by aid projects. Within the limits of their immediate objectives and the scope of their competence, they have generally been successful in identifying priorities - for most of them the inventory of the resources and their quantitative assessment - as well as the appropriate actions (developing and applying methods - including surveys - for resource evaluation) required to reach them. As a result, most of them have efficiently contributed to the acquisition of qualitative and quantitative information on the resources and, through on-the-job training and the granting of fellowships, to the training of large numbers of fishery scientists in developing countries.

61. However, their impact on the development and, even more, on the management of national fisheries have generally been far less satisfactory. Furthermore, too often their contribution to the strengthening of national institutions and structure did not have the lasting effects that one would have hoped.

62. Causes of such deficiencies are many and difficult to separate objectively. Because development is an extremely complex process (Annex 8), it is not generally possible to relate directly causes and effects and, in particular, development achievements to field project inputs alone. In several countries, national administrations were not fully aware of the opportunities offered by national fisheries nor of the requirements - especially with respect to the research input - for their rational development and sound management. As a consequence, not enough consideration has been given to the formulation of long-term and comprehensive fisheries and research policies and to the need for sectoral projects to be harmoniously integrated in overall plans. Indeed, lack of continuity was identified as one of the main deficiencies in a majority of projects. This lack of continuity resulted in too short commitments of funds, by aid agencies, and in unexpected changes of attitude of governments toward the objectives of the project.

63. The deficiencies were particularly harmful as regards the strengthening of national scientific capabilities and the institution building. While specific research programmes can successfully be executed during the average time span of most field projects - generally, a few years, the development of national research capabilities and institutions is a process which imperatively needs to extend over a period of time considerably longer than the normal duration of UNDP and most bilateral projects.

64. In Annex 8, the author emphasizes the superiority of "programme-oriented" over "objective-oriented" projects, i.e., of projects aiming at assisting countries in establishing certain capabilities and infrastructure rather than at the execution of specific sets of

investigations. Such distinction may not be as critical as suggested if the information required to rationally develop and manage national fishery resources, the means required for such development and the ways to mobilize them - including the role assigned to external assistance - are properly identified and planned.

65. The comment made in the same document that, in several countries, the practices of fishery science did not go much further than the immediate application of quantitative stock assessment models, without sufficient attention being given to the broadest aspects of ecosystems'behaviour and stock long-term viability, can be attributed, among other things, to the fact that research teams in most developing countries were at the initial stages of their development. They could not be expected, therefore, to immediately master the complexities of the fisheries issues taken in their broadest context. However, as their formal training and experience grow - and this can more efficiently be done if they concentrate their efforts on the more immediate, concrete and easy to attack issues of fishery development and management - it could be expected that they would progressively broaden their field of concern and give more attention to the many complexities of marine ecology.

66. The limited impact that several aid projects have had on the development of national fisheries can be attributed to some extent to difficulties in comunicating with the administration and the industry and to a lack of comprehensiveness in the planning of the provision of aid. Fishery research projects were often developed and implemented without enough consideration being given to the other aspects of fishery development (fishing technology, fish processing, marketing, etc.) and research (marine biology in particular). The example of the Thai/German bilateral programme (Annex 12) and that of the multilateral assistance to Cuba (Annex 11) indicate that a comprehensive and long-term planning can indeed achieve broader impacts and lasting effects.

67. With the strengthening of planning capabilities in recipient countries, which now have the major responsibility for the utilization of international aid funds, and with the increased experience of local conditions and requirements gained by aid organizations, these limitations can be expected to be progressively overcome. In this respect, national planning agencies have a major role to play in ensuring proper coordination and distribution of aid programmes financed from different sources, both bi- and multilateral.

6.1.2 Project implementation

68. Some projects found difficulties in properly meeting simultaneously the two basic objectives mentioned earlier, viz. the execution of research investigations and the strengthening of research capabilities. To a large extent, this depended on the project personnel. Some projects put emphasis on the achievement of scientific findings and did not always involve fully national counterparts and institutions in their various research activities. Others did not integrate themselves sufficiently within the national structures and institutions to which they were attached. This affected negatively communications between the national and expatriate components of the project and the general attitude of national institutions toward the project. In this respect, the Working Party noted that international team leaders and national directors have a special responsibility in ensuring good communications and collaboration between international experts and national counterparts, as well as between the project and the national administration. The Working Party considered this attribute as important as their scientific qualifications.

69. Long delays were often observed in the provision of experts, equipment and in the execution of the projects in general. The Working Party recommended that this should be avoided.

6.1.3 Expertise

70. The qualifications of international experts are considered as one of the main factors in the success or failure of field projects. Such experts should combine a variety of

qualifications: technical expertise, languages, ability to adapt and to work with people of different cultures, etc. Such requirements account for the shortage of experts which is often observed. This situation is increased by the reluctance, often noted, of specialists to go abroad and one of the reasons for their low mobility is that they are often government employees to whom international organizations do not offer the security in employment normally provided in their home institutions. They may not retain such security when joining international organizations temporarily. Such situations could be improved if governments and national administrations would adapt the conditions governing leaves of absence and secondments.

71. Similar difficulties are encountered in the selection of national experts (counterparts). Sometimes these have been selected on the basis of their language qualifications rather than on their scientific background or their future duties. Great care should be given to their selection and the long-term planning of their careers. Monitoring of their activities is also essential and the national leader and the international experts have a special responsibility in developing and implementing procedures to evaluate the progress and difficulties of national experts.

72. In some countries shortages of counterparts with adequate qualifications for a given project have been encountered. This situation may have various causes, e.g., a general lack of educated manpower in the country, priority given to other sectors in the utilization of available expertise, etc. Sometimes, the request for counterparts for a specific project has been excessively demanding to the country. The decision to undertake the project may still be taken should the project outputs be essential for the development of the national fisheries. When less emphasis has to be given to the training component of the field project, this should be discussed and agreed upon between the government and aid organization when the project is formulated.

6.1.4 Equipment

73. Excessive delays have frequently been observed in the delivery of equipment and spare parts. This may seriously affect the execution of the project schedule. However, it has already been noted that, with the exception of the supply of research vessels and their equipment, e.g., instruments for acoustic surveys, the needs for sophisticated equipment are relatively limited in resource evaluation studies. Expensive equipment is more often needed in other disciplines, such as pollution studies or oceanography, and here lack of adequate material can be a limiting factor in certain circumstances. To facilitate the identification of equipment and speed up its delivery, comprehensive catalogues of equipment most commonly used in fishery resources research should be kept and regularly updated by FAO.

74. It was noted that there is a tendency among a number of developing countries to acquire sophisticated equipment which is not always within their present capacity to use. Not only does such equipment add to the cost of the project, but also poses other problems, such as maintenance and repair, the means and facilities for which are not always available in the country.

75. As regards research vessels, the Working Party recognized that, with the increased importance of survey work for monitoring and assessing fish resources, the need for research vessels had increased. However, several research institutions had encountered insuperable difficulties in meeting satisfactorily the running and maintenance costs of the vessels they had bought or acquired from aid programmes. Acquisition of research vessels should be examined with utmost care, taking into account the resources, both financial and human, required for their subsequent utilization.

6.1.5 Follow-up

76. Project achievements need to be more thoroughly evaluated, both by the recipient country and the aid organization. Post-project audits should preferably include people who have not

been involved in project activities. Because of the slow development of scientific capabilities, a second evaluation should preferably take place a few years after large projects have been completed.

77. Furthermore, the follow-up of research and institution-building projects should receive more attention. As the development of research capabilities is a long process, the newly established research institutions need assistance, though at a declining rate, for many years after the completion of aid projects. More generally speaking, with the progressive building-up of national capabilities, there is a shift in the aid requirements in the field of fishery research. Rather than self-contained long-term projects, several countries which already possess some scientific capabilities and experience in the basic fields of fishery science need more short-term visits of consultants in specialized fields (e.g., in the design of resource survey programmes or of statistical schemes, in computer and data processing, in research programming and planning, etc.).

78. Similarly, research institutions in developing countries need fellowships for regularly upgrading their research personnel. They need to organize and attend regional working parties and workshops. They are frequently encountering serious difficulties in mobilizing, from their own budgets, the funds to support such short-term activities. Most aid in research projects does not contain any provision to adequately cover such activities after completion of the projects, although such inputs often condition the firm establishment of the research programmes and institutions they have initially assisted. Recently, regional aid programmes have provided some support on an _ad hoc_ basis in this respect. However, their means are usually insufficient to adequately cover these needs. Furthermore, several regions do not benefit from the services of such programmes. Therefore, the Working Party recommended that these long-term needs be fully taken into account when aid projects are formulated and plans for their support made by national administrations and aid organizations.

6.2 Institution-Building Projects

79. This type of project is particularly important for the long-term development of scientific capabilities in developing countries. However, only a relatively limited number of projects have had this specific goal among their major objectives. This is probably related to the fact that the decision to undertake such projects implies long-term and comprehensive commitments which only a few developing countries have been able to make so far. Similarly, on the basis of the documentation submitted to the Working Party for its second session, it appears that developing countries often encounter serious difficulties in maintaining and strengthening research units initially established with the support of aid programmes.

80. Failures to do so seem to have several interrelated causes:

(i) Inadequate attention being given, when formulating the project, to the identification of the proper counterpart institution; this subsequently prevents the activities developed with the support of the project to be followed up by the appropriate institution;

(ii) The inability of the national administration to make full use of the outputs of the national research institution;

(iii) The general level of economic development of the recipient country which is later unable to maintain the required support to research activities; this results in losses of trained staff, little or no growth and development of research programmes in the research institution, and

(iv) The insufficient support given by the government to the expansion of research activities as a result of the low priority assigned to the fishery sector in the development of the national economy or to research in planning development of national fisheries.

81. Indeed, the existence of a national administration capable of supporting and making full use of the research findings was stressed as representing an essential condition of the success of institution-building projects and, more generally, of the development of national scientific capabilities. Political and administrative changes were mentioned by the Working Party as one major cause of the partial failure of aid in research projects. The need for continuity, which has been stressed on various occasions as a condition for the building-up of scientific capabilities, is especially important for the development of efficient and self-reliant research institutions.

82. To overcome the above identified limitations, different approaches are required. Proper account should be taken of existing institutional structures and, possibly, of the need to amend or to complement the existing ones so that the activities promoted by the aid project are inserted in and, later on, taken over by the appropriate national institution. Long-term arrangements should be sought and planned by both the national administration and the aid agency to ensure sufficient continuity in the provision of support and technical guidance to national research activities. In case national administrations are not sufficiently aware of the opportunities offered by the fisheries for the development of national economies, proper attention should be given, when planning the aid to the national fishery research programmes, to the need for improving the assessment of the fishery opportunities and communications with the national administrations concerned.

83. Among the various schemes which have been successfully used for providing scientific guidance in developing research institutions, the twinning arrangements between a developing research institution and an advanced laboratory have certainly stimulated great interest. Such a scheme offers several basic advantages for providing aid: duration and continuity, flexibility and adaptability in the interchange of junior and senior experts between the sister institutions, responsibility given to scientific leaders in the developing institutions for the identification and execution of major research programmes, etc. At the same time, they offer advanced institutions new opportunities to study other ecosystems and to widen their experience. This scheme of cooperation is particularly well adapted to institution-building, as it can provide the long-term, evolutive and highly specialized guidance which, as has been seen, is mostly needed.

84. Various examples of application of this scheme have been mentioned, among which cooperation between Thailand and Fed.Rep. of Germany has been particularly successful (Annex 12). However, FAO has encountered difficulties in promoting and utilizing this type of arrangement. So far the administrative difficulties encountered in organizing such cooperation have been better overcome under bilateral aid programmes. The Working Party was of the opinion that larger recourse should be made to this type of cooperation, especially in institution-building projects. It expressed the hope that FAO could use more frequently this approach for its own projects and continue its efforts to promote this kind of partnership in bilateral cooperation.

6.3 Inter-Country Projects

85. The Secretariat presented the objectives, functions and activities of inter-country programmes conducted by FAO with the support of UNDP and other donors, as well as present plans regarding their expansion. FAO regional aid programmes, as presently established, do not normally undertake investigations themselves. Their main functions are the following:

(a) They support the activities of national and regional institutions (e.g., fishery bodies) in problems of regional relevance (compilation and dissemination of statistics, stock assessment, management of shared stocks, etc.);

(b) They support and provide technical backstopping for cooperation among member countries on problems common to several of them where benefits - economy of scale, better use of scarce expertise - can be derived from a concerted approach;

(c) They promote, through the undertaking of basic studies, a better understanding of fishery development opportunities and management requirements at both national and regional levels;

(d) They can provide, at member countries' request, short-term assistance of project experts and consultants in highly specialized fields.

86. There are plans to expand these activities in areas not yet covered by existing programmes and to complement them by interregional programmes, the purpose of which is to facilitate dissemination of information and experience between regions and to provide support to activites of global relevance (preparation of fish identification sheets, preparation of training material in fishery management, etc.). FAO is also executing a global project, the purpose of which is to conduct, with a research vessel provided by Norway acoustic surveys off the shores of various countries in the Indian and Atlantic Oceans, and to develop simpler methods for resource evaluation.

87. A project proposal has also been submitted to the UN Interim Fund for Science and Technology for Development. The purpose of this Fund will be primarily to strengthen the research capabilities of developing countries rather than conducting research investigations as such. The FAO proposal aims at promoting the scientific and technological capacities developing countries need to use fully and rationally the fishery resources available within their respective exclusive economic zones.

88. The Working Party noted with satisfaction that these various inter-country activities have substantially improved the resource research programmes in the various regions and had increased the competence and cooperation among national scientists. It further noted that a regional approach was especially important in areas where fisheries resources are shared and the countries have joint responsibility for the management of these resources.

89. Some regional projects, with their close and personal contacts with the scientists in the region, were particularly successful in promoting cooperation between laboratories, helping to coordinate and standardize research activities relating to stocks exploited by more than one country, the exchange of scientists between developing countries and the better use of scarce manpower and facilities available. Where some countries in a region have established cooperation in research, the projects were able to assist them in developing it further.

90. It was considered that an important contribution to the success of workshops and other related inter-country activities was the possession of adequate funds by the regional projects to support full participation of national experts in such activities. This would help to ensure the most appropriate participation. More generally speaking, greater attention should be given to the means of ensuring more contact among scientists of developing countries. Attendance at scientific as well as operational meetings should receive more emphasis in connexion with on-the-job training and, through higher level scientific review, improvement of scientific competence. Similarly regional programmes should assist member countries, by organizing training courses and seminars on topics of regional relevance, by providing fellowships wherever appropriate, etc.

91. The regional projects could also provide assistance in the publication of results of the working groups and manuals in the appropriate language of the region.

92. The Working Party recommended that, wherever available, experts and institutions from the regions should be utilized. Various approaches could be used to increase the use and, thus, the development of local expertise. In addition to the recruitment of experts and consultants, regional programmes should as much as possible have recourse to institutions from the regions they are serving. Research contracts would be established to study issues of regional significance. Such contracts could be paid for by providing additional funds and equipments to national teams but also by providing technical inputs of outside senior experts for the critical parts of the research programmes (e.g., planning, data interpretation, etc.).

93. It was also noted that there were many similarities between the functions of the FAO Regular Programme and the terms of reference of the UNDP Interregional and Global Programmes. Considering the long experience that FAO had aquired in the exchange of information, methods and experience among regions - especially between developed and developing ones - and the promotion of research investigations on topics of direct relevance for fisheries in the Third World, the Working Party stressed the need for full coordination and cooperation between the activities planned and financed under these programmes.

94. The Working Party further noted that funding of regional projects was meeting difficulties. This was affecting the support these projects were giving to the strengthening of research capabilities of their member countries as well as the broadening of activities and the establishment of similar programmes in other geographical areas.

7. TRAINING AND EDUCATION

7.1 Availability and Qualifications of Graduates and Technicians

95. In certain countries where priority in the use of available manpower has to be given to other sectors (administration, education, etc.), shortage of graduates already trained in basic sciences as well as of technicians familiar with relevant technologies has been temporarily a limiting factor in the development of fishery resource investigations. The consequences of such a shortage can become more acute when their general background in mathematics and statistics is limited. Such limitations should be taken into account at national level, as well as by international organizations such as Unesco, when formulating the curricula for secondary schools and universities. The Working Party therefore welcomed the start made by FAO and Unesco to jointly develop a fisheries science curriculum which would assist universities in formulating training programmes in this field. It hoped that their recommendations would soon be available.

96. Training of technicians also contributes to the development of the research personnel. Actually, the distinction between research officers and technicians should not be looked at statically but dynamically and full attention should be given to the educational process which will enable technicians with potential for development to meet the academic and administrative qualifications required for scientists.

7.2 On-the-Job Training

97. On-the-job training is usually an integral part of FAO research projects. It is therefore important that the international experts selected have the capacity to impart their knowledge and that the national experts are well chosen to benefit from this and are likely to continue in the field of work covered by the project. However, more formal training programmes during research projects are of considerable value in training other national research staff who are not specifically counterparts. The Working Party recommended that, wherever appropriate, the carrying-out of training lectures or courses should be included in research project documents.

98. Adequate consideration has not always been paid to the fact that training is a process which should continue throughout the active life of scientists and technicians. Periodic courses and seminars should be organized within each research laboratory to train junior scientists and technicians, discuss research findings of individual scientists during the course of their investigations, and to generate among them appropriate awareness of the national fishery research requirements. The Working Party believed that FAO could play a greater part in these activities outside the duration of projects. It recommended that FAO make it known to the research institutes as well as universities in developing countries that they could be assisted with training material, lectures for courses and visits by consultants for informal discussions on basic research topics, methodologies and programmes.

7.3 Manuals on Resource Research

99. The Working Party recognized the very important role that FAO manuals on fisheries sciences have played in helping fisheries biologists all over the world in acquiring methods and approaches for their investigations of fishery resources. The manuals have also played a valuable part in training courses and, in fact, several have started as material prepared for such courses. Their importance to workers in the developing countries was clearly seen in the 60 replies received to a questionnaire on the availability and usefulness of FAO manuals and related documents (Annex 7), sent out for the Working Party in early 1980. Around 60 percent of those replying had their own personal copies of the most important FAO manuals.

100. However, the identity of the FAO manuals as a distinct series has been lost with their incorporation into the series of Fisheries Technical Papers. Some 22 publications in that series now bear explicitly the connotation "manual" but they are difficult to identify and they do not give a coordinated coverage. Their usefulness would be considerably enhanced if the original concept of the manuals, as a distinct series of publications planned to cover the various sections of work in which fisheries scientists are involved, was retained and if they were regularly updated to include new concepts and methods as they became generally accepted. They need to be prepared as manuals, with their use by scientists in developing countries kept clearly in mind where many will not be reading them in their mother tongue.

101. To establish and maintain such a series of manuals, the Working Party recommended the setting-up of a small technical editorial group, made up of Headquarters staff and fisheries scientists from developing and developed countries. This group should work by correspondence and meet from time to time as required; it should have the responsibility to plan the coverage of the series and to supervise the preparation, editing and periodic updating of the manuals. The manuals should not be priced items and would be distributed through the FAO machinery.

102. The regular distribution of FAO documents, including manuals and related documents, to research institutes is very far from complete. The Working Party, therefore, recommended that the distribution arrangements should be reviewed and, in particular, that the Short Marine and Inland List should be brought up to date.

103. It was further observed that there has been a falling-off in the number of manuals and related documents in resources research that were available in more than one FAO language. Therefore, special attention should be paid to the translation of the FAO manuals and related documents into other languages.

104. The Working Party recognized that the preparation of such manuals and their translation would be costly and raise particular difficulties. In order to facilitate the work, it recommended that FAO should seek funds from outside agencies and obtain the collaboration of national research institutions for translating the manuals into as many languages as would be justified for ensuring the appropriate dissemination of their contents.

7.4 Training Courses

105. FAO training courses in resources research cover three scientific fields: (i) basic concepts and methods in fishery biology, (ii) statistics and sampling methods, and (iii) stock assessment, acoustic surveys and other specialized topics. During the period 1972-79, when most of the courses have been held, there were five in basic methods, eight in statistics and 14 in specialized topics. Of the five in basic methods, one was held in Asia, one in Latin America and three in Africa.

106. Although the developing fisheries institutes in many countries are increasingly organizing their own training courses, these basic courses are still widely needed and their

frequency should be increased. In view of the increasing costs of training courses and the need to cover new fields, FAO should seek additional sources of funding. Also, as mentioned in section 7.2, there is a real need for FAO to be in a position to give more assistance to national research institutions and universities in developing countries in planning and running their own courses by providing training materials, advice and one or more tutors for such courses. Regional programmes, if adequately financed, are particularly fitted to assisting with these courses.

107. The success of training courses requires the input of experts with an appropriate understanding of the needs of recipient countries, of the characteristics of the fisheries in the region covered, of the manpower availability, as well as of training priorities. It recommended that training courses be based as often as possible on local examples. These conditions are not always met.

108. As training courses are expensive in terms of funds and manpower, it is essential that they are carefully planned. Financial support requirements, as well as administrative procedures for the preparation of the courses, are usually heavy. These could be reduced by having the courses organized locally by countries and by regional projects.

109. The need for specialized training courses are likely to increase as more sophisticated methods become available. However, the function of those on resource assessment at an advanced level is partly being fulfilled by working groups which are primarily concerned with the analyses of research data but also provide a substantial amount of training.

7.5 Training Centres

110. The setting-up of regional training centres has been proposed on some occasions over many years. However, few have been established. The most successful one has probably been the training centre for acoustic survey methods in Lima, Peru, which functioned well for five years. Others have been less successful. Many factors had to be favourable for them to remain viable and, in any case, it was likely to take several years for such centres to become established. However, if the conditions were suitable, the Working Party thought that such centres could be a success,particularly if they were associated with a university or other training institution with which they would progressively be integrated.

7.6 Scholarships and Fellowships

111. There is no analysis of the numbers of scholarships and fellowships taken up in recent years, nor of the countries sending students or the institutes receiving them. There are also no data available on similar scholarships and fellowships undertaken without FAO assistance. There is, however, the result of a pilot study by EXTRACO on fellowships awarded by FAO in the field of fisheries science in the years 1965-71. A 75 percent response showed up the problems of inadequate knowledge of the appropriate language, insufficient relevance of the training and the extensive loss of trainees to other jobs.

112. In the identification of needs, a clear distinction has not always been made between the provision of academic training in foreign universities (scholarships) and visits to research institutions (fellowships). The second scheme should be reserved for scientists already trained in the basics of their disciplines and preferably with already a few years of practical experience. Visiting scientists should preferably be sent to institutions within the same region, or in regions where fishery resources and research investigations show sufficient similarities to those which they are likely to encounter in their home countries. The best duration for most of such fellowships would probable fall between three and six months. There is also a need for fellowships in countries of other regions, in laboratories conducting advanced research on topics of special relevance to the fellow's work.

113. The selection of the most suitable conditions, and of the most appropriate institutes for them to work in, was recognized as of major importance. Regional programmes would have much of the information needed for making the best choices.

7.7 Dissemination of Scientific Literature

114. The Working Party noted the progress of ASFIS[1] and welcomed the plans to make its publications and facilities more widely known among the fisheries scientists of developing countries. However, the limited libraries and facilities for library loans in several developing countries make ASFA[2] of little value in many of these countries at present. ASFIS could usefully look into the specific problem of information dissemination in developing countries to see how their particular needs can be met.

115. Many useful reports of investigations by laboratories in developing countries remain in mimeographed form and their distribution is often limited to the department of origin. There are often problems of publication of scientific papers and delays can be long. Regional programmes can help by publishing papers submitted to regional workshops, but this has its limitation as to coverage. There is a need for regional fisheries journals, like the Journal du Conseil of ICES, which would facilitate the publication of papers of regional interest.

116. The possibility of developing selected existing libraries into regional libraries with large coverage, which offer special loan and copying facilities to countries of the region, should be investigated, as the lack of library facilities was considered by the Working Party to be one important obstacle to the development of scientific research in developing countries.

1/ Aquatic Sciences and Fisheries Information System

2/ Aquatic Sciences and Fishery Abstracts

RESUME DES CONCLUSIONS ET RECOMMANDATIONS

Les besoins de la recherche halieutique au niveau national

Le Groupe de travail a conclu que, dans tous les pays en développement, les moyens et les crédits consacrés à la recherche halieutique sont dans l'ensemble insuffisants, tant du point de vue quantitatif que du point de vue qualitatif (par. 35). Cette situation est devenue d'autant plus préoccupante que la réforme du droit de la mer a accru les responsabilités de tous les Etats côtiers et, partant, les besoins de la recherche, en particulier dans les pays en développement.

La première condition à un développement satisfaisant des capacités nationales de recherche, est l'existence de politiques globales et à long terme dans les domaines de la pêche et de la recherche (par. 62). Cela suppose que l'on précise les objectifs et définisse les priorités dans ces domaines. Ces préalables, joints aux caractéristiques particulières de la pêche tropicale et aux conditions de la recherche dans les pays en développement ont, à leur tour, des effets importants sur les possibilités d'application des méthodes et programmes de recherche halieutique dans ces pays (par. 17-23). L'ampleur et les caractéristiques des programmes nationaux de recherche dépendront de facteurs tels que l'importance économique des pêches nationales ou la taille des économies nationales. Mais, pour tout pays quel qu'il soit, la création et le bon fonctionnement de systèmes statistiques permettant d'évaluer et de surveiller les pêcheries nationales sera une tâche prioritaire (par. 19).

Le Groupe de travail reconnaît que le développement des capacités de recherche suppose l'existence de rouages administratifs efficaces (par. 81) et d'institutions (par. 38-44) propres à assurer l'appui et les communications nécessaires, en particulier en ce qui concerne les applications de la recherche. Pour faciliter les échanges réciproques d'information entre la recherche et l'administration, le Groupe de travail estime préférable que l'unité de recherche soit administrativement rattachée, ou associée, à la direction nationale des pêches (par. 38).

Le Groupe de travail reconnaît que la pénurie de crédits dans les pays en développement signifie souvent que les ressources allouées à la science et la technologie sont bien inférieures à ce qu'il faudrait pour atteindre le niveau souhaité (par. 8, 49 et 57). Pour mobiliser les compétences techniques variées et nombreuses nécessaires à un développement cohérent et à une utilisation rationnelle des ressources halieutiques, il importe de procéder à une analyse des effectifs et d'établir une planification à long terme (par. 36). Si l'on veut disposer d'un personnel qualifié et en nombre suffisant, les chercheurs et techniciens nationaux doivent bénéficier de conditions de travail comparables à celles qui sont offertes dans les autres secteurs de la recherche et de l'université (par. 49). En ce qui concerne les navires de recherches qui coûtent très cher, non seulement à l'achat mais aussi en frais de fonctionnement et d'entretien, le Groupe de travail recommande que les pays mesurent attentivement s'ils ont les moyens d'assumer ces dépenses avant de prendre la décision d'acquérir ces navires même s'ils leur sont fournis sans frais (par. 74 et 75).

Coopération régionale

Le Groupe de travail rappelle que la coopération régionale est particulièrement nécessaire dans le domaine de la recherche sur les ressources halieutiques. Il y a deux raisons à cela: premièrement, c'est la seule méthode qui permette d'évaluer et de surveiller des stocks qui se répartissent et se déplacent de part et d'autre de frontières définies par l'homme; deuxièmement, c'est une réponse possible aux difficultés rencontrées par les pays pour mobiliser, individuellement, la "masse critique" de compétences techniques, de crédits et de matériel (par exemple navires de recherches, ordinateurs, etc.) (par. 53). A cet égard, les organes régionaux des pêches, en particulier ceux que la FAO a créés dans la plupart des zones tropicales, ont un rôle particulièrement important à jouer. Ils offrent aux pays membres un dispositif qui leur permet de promouvoir et d'organiser la coopération régionale (par. 44-46). Le Groupe de travail signale, à titre d'exemple, que la participation à des groupes de travail, séminaires et autres activités régionales est en général le moyen le plus efficace pour de jeunes chercheurs d'acquérir une véritable maîtrise de leurs disciplines de recherche et de se tenir au courant des nouvelles méthodes (par. 45).

Pour tirer pleinement parti des possibilités offertes par la coopération technique (CTPD), en particulier au niveau bilatéral, les pays en développement ont besoin de davantage de ressources, notamment en devises étrangères (par. 46). Compte tenu des insuffisances qui affectent actuellement la publication et la diffusion de la documentation scientifique dans les régions en développement, les organes et programmes régionaux des pêches et les organismes d'assistance devraient envisager d'urgence la possibilité de créer et de soutenir des revues scientifiques, des centres de documentation et des bibliothèques de prêt d'intérêt régional (par. 23, 54).

Projets d'aide à la recherche

Sur la base de l'évaluation des résultats obtenus dans le passé par un certain nombre de projets d'assistance, le Groupe de travail estime que la condition première du succès de ces projets est qu'ils soient conçus comme faisant partie intégrante des stratégies globales de développement et à long terme (par. 62). C'est aux administrations nationales que revient au premier chef la responsabilité de mettre au point et d'appliquer ces stratégies.

La compétence des experts étrangers et nationaux qui participent aux projets de terrain - et en particulier les directeurs de projets - est, pour les projets d'aide à la recherche, un facteur de succès déterminant (par. 70 à 73, 95). On a constaté que la FAO a souvent des difficultés à recruter, pour le terrain, des chercheurs d'un bon niveau technique. Il faut espérer que la FAO, en collaboration avec les administrations nationales, réussira à établir des procédures et des conditions qui faciliteront le détachement temporaire de fonctionnaires (par. 70).

En outre, la plupart des projets d'aide à la recherche ont fondamentalement deux objectifs: i) l'exécution d'un programme de recherche donné et ii) le renforcement des capacités nationales de recherche. Les délais nécessaires pour que les effets de cette aide se fassent sentir sont beaucoup plus longs dans le second cas, en particulier lorsque le projet vise à créer des instituts nationaux de recherche. On n'a pas toujours dûment tenu compte de cette différence au moment de la formulation des projets, ce qui a entraîné des prévisions insuffisantes en matière de financement et de durée (par. 63). Avant d'atteindre leur maturité et leur autosuffisance scientifiques, les nouveaux instituts de recherche ont besoin d'une assistance fréquente (visites de spécialistes étrangers, octroi aux jeunes chercheurs de bourses de perfectionnement auprès de laboratoires avancés, etc.), cela pour une période qui dépasse généralement la durée moyenne des projets actuels (par. 77 et 78). Le Groupe de travail recommande à la FAO et aux organismes d'assistance tels que le PNUD de tenir dûment compte de cette nécessité.

Le Groupe de travail est aussi d'avis que des accords de jumelage entre établissements de pointe et laboratoires de recherches soigneusement choisis dans les pays en développement sont une méthode très efficace pour fournir une assistance technique à la recherche halieutique et à la création d'institutions. Il espère que la FAO et les autres organisations internationales sauront surmonter les difficultés administratives qui s'opposent encore à un recours plus fréquent à cette forme d'aide (par. 83 et 84).

Le Groupe de travail se félicite de la création par la FAO de nouveaux programmes régionaux de terrain. Ce type de projets a prouvé son efficacité lorsqu'il s'agit d'apporter un soutien technique aux activités des organes régionaux des pêches (par. 10, 89); de promouvoir la CTPD, notamment par des contacts plus rapides, des recherches conjointes (par. 90), l'interprétation en commun de résultats de recherches (par. 53) entre instituts de recherches et experts des régions; enfin, de favoriser des activités de formation dans des domaines hautement spécialisés (par. 50, 96, 97). Le Groupe de travail espère que des ressources supplémentaires pourront être mobilisées afin d'élargir le champ d'application géographique et la portée des activités de ces projets (par. 90 et 91).

Il faudrait aussi utiliser autant que possible les compétences scientifiques et les instituts existant dans chaque région pour mettre pleinement à profit leur expérience directe des conditions particulières à la région et leur donner ainsi l'occasion de se développer (par. 90, 92). Vu les nombreuses similitudes qui existent entre les activités menées dans le cadre du programme ordinaire de la FAO et celles qui sont financées par les programmes interrégionaux et mondiaux du PNUD, et compte tenu de la longue expérience acquise par la FAO dans la plupart des domaines concernés, la préparation et l'exécution de ces activités appellent une bonne coordination (par. 84).

Formation

Le Groupe de travail a attentivement passé en revue et évalué les activités de la Division des ressources halieutiques et de l'environnement dans ce domaine et reconnu l'importance des cours de formation et des manuels de science halieutique de la FAO (par. 99 à 109). Le Groupe de travail recommande que les séries de manuels de la FAO restent distinctes, complètes et à jour (par. 100) et qu'un bureau de rédaction soit créé à cet effet (par. 101). Le Groupe de travail souligne en outre que, dans l'exécution de son programme, la FAO doit donner l'attention voulue à la formation des formateurs (par. 98, 106).

Diffusion de la documentation scientifique

Enfin, le Groupe de travail a étudié le problème de la diffusion de la documentation scientifique. Il faudrait accorder plus d'importance à la traduction (par. 103) et à la distribution (par. 102) des documents de la FAO. De nombreux pays en développement ne disposent pas encore des services de documentation et de bibliothèque qui permettent d'utiliser au mieux les programmes ASFA1/ et ASFIS2/. Il convient donc de tenir compte des besoins spécifiques des pays en développement et des conditions générales qui existent dans ces pays pour poursuivre la mise au point et l'exécution de ces programmes (par. 114).

1/ Résumés sur les sciences aquatiques et la pêche

2/ Système d'information sur les sciences aquatiques et la pêche

1. INTRODUCTION

1. A sa neuvième session, le CCRRM a recommandé que la FAO constitue, dans le cadre du CCRRM, un "Groupe de travail sur la promotion de la recherche sur les ressources halieutiques des pays en développement", ayant le mandat ci-après:

(i) Prendre des dispositions pour l'analyse d'un choix de projets d'assistance au développement intéressant la recherche sur les ressources, la création d'instituts de recherche et la mise en place de divers types de programmes et activités de formation, en vue d'évaluer le déroulement et l'efficacité de diverses approches et politiques.

(ii) Etudier les grandes lignes de systèmes d'organisation et de planification de la recherche sur les ressources halieutiques, en insistant plus spécialement sur la pleine utilisation de moyens de recherche peu abondants.

(iii) Envisager des arrangements institutionnels pour la coopération internationale dans le domaine de la recherche, notamment dans le cadre d'organisations internationales régionales, par exemple les commissions des pêches.

(iv) Mettre au point des ensembles de stratégies et de tactiques pour l'assistance au développement de la recherche halieutique, y compris le transfert des techniques, la formation et l'organisation, et applicables aux programmes bilatéraux entre pays développés et en développement, aux programmes des organisations internationales et à la coopération entre pays en développement.

La liste des membres du Groupe de travail figure à l'annexe 1.

2. Suite à une demande de la FAO, l'Organisme norvégien pour le développement international a offert de prendre à sa charge les frais de la première session qui s'est tenue à la Svanøy Foundation, près de Florø (Norvège), du 2 au 8 septembre 1979. La liste des documents établis à cette occasion figure à l'annexe 2.

3. L'ordre du jour adopté pour la première session était le suivant:

(1) examen du mandat;

(2) objectifs de la recherche sur les ressources halieutiques, spécialement en ce qui concerne les régions en développement;

(3) théories, méthodes et matériel de la recherche sur les ressources halieutiques, en égard en particulier aux conditions existant dans les pays en développement et au transfert de technologie;

(4) organisation, aux niveaux national, régional et international, de la recherche sur les ressources halieutiques;

(5) quelques résultats de l'aide à la recherche sur les ressources halieutiques:

    (a) projets de recherche,
    (b) projets visant à la création d'institutions,
    (c) formation et enseignement;

(6) besoins de la recherche sur les ressources halieutiques (financement, matériel, personnel);

(7) organisation des activités futures du Groupe de travail.

Un rapport intérimaire a été établi à cette occasion.

4. La session a circonscrit plusieurs facteurs liés aux problèmes de la recherche sur les ressources halieutiques dans les pays en développement. Toutefois, nombre de ces problèmes ne pouvaient être étudiés ou évalués comme il convenait sans une analyse en profondeur des éléments suivants:

(i) état de la recherche sur les ressources dans les pays en développement;

(ii) programmes de formation organisés dans le passé par les Nations Unies ou l'aide bilatérale;

(iii) contribution des projets d'assistance aux capacités de recherche halieutique et

(iv) capacité actuelle des pays en développement de former des diplômés et des étudiants de troisième cycle en sciences de la mer (notamment halieutique).

5. Le Groupe de travail a aussi considéré que ses travaux devaient s'appuyer sur une évaluation des résultats de la Conférence des Nations Unies sur la science et la technique au service du développement (qui a eu lieu à Vienne, Autriche, du 20 au 31 août 1979) et du rôle des organes régionaux des pêches et des programmes d'aide de la FAO destinés à soutenir et promouvoir la recherche sur les ressources halieutiques dans les pays en développement. Il a donc décidé, à la première session, que des documents de fond sur les sujets suivants seraient établis pour étayer les débats de la seconde session:

(i) évaluation de l'état de la recherche sur les ressources halieutiques dans les pays en développement;

(ii) examen critique des cours et centres de formation halieutique de l'ONU/FAO et de quelques organismes bilatéraux;

(iii) effets de quelques projets (ONU et bilatéraux) d'assistance aux pêches sur le niveau des compétences techniques nationales dans le domaine de la recherche sur les ressources halieutiques dans les pays en développement;

(iv) possibilités de formation universitaire et post-universitaire existant dans les pays en développement dans le domaine des sciences de la mer - y compris en statistiques;

(v) évaluation des recommandations de la Conférence des Nations Unies sur la science et la technique au service du développement;

(vi) rôle des organes régionaux de la FAO et des projets et programmes régionaux de terrain destinés à appuyer et à promouvoir la recherche sur les ressources halieutiques dans les pays en développement.

La liste des documents établis pour la seconde session figure à l'annexe 3.

6. La seconde session du Groupe de travail a eu lieu à la FAO à Rome du 8 au 12 septembre 1980. L'ordre du jour adopté pour la seconde session figure à l'annexe 4.

7. Les débats de cette seconde session ont été consacrés à la mise à jour de l'évaluation concernant l'état de la recherche sur les ressources halieutiques dans les pays en développement, aux effets des projets d'assistance (bilatérale, multilatérale et multinationale) et aux améliorations à apporter aux programmes d'assistance compte tenu des informations rassemblées depuis la première session.

8. Ces travaux ont été menés à la lumière de certaines recommandations de la Conférence des Nations Unies sur la science et la technique au service du développement (Vienne, Autriche, août 1979, voir annexe 10). Parmi ces recommandations, on constate notamment que

la pénurie de ressources financières dans les pays en développement signifie souvent que les ressources allouées à la science et à la technologie sont bien inférieures au minimum requis pour atteindre les résultats escomptés; on reconnaît également qu'il est urgent de mettre en place des mécanismes permettant d'augmenter le volume et d'améliorer les conditions du transfert de ressources financières destinées à la science et à la technologie dans les pays en développement. Sans nier l'importance cruciale du financement, le Groupe de travail estime que les politiques adoptées en matière de science et de technologie par les pays bénéficiaires sont, en dernière analyse, les facteurs décisifs et devraient donc être considérés comme une condition nécessaire à la coopération scientifique internationale et régionale. Cela suppose une définition correcte des priorités et une planification à long terme.

9. Pour ce qui est des institutions à créer dans le domaine de la science et de la technologie, de l'avis général, les pays en développement doivent veiller à la compatibilité et à la coordination des différents éléments qui composent le système science et technologie (utilisateurs et producteurs de science et de technologie). En conséquence, il faudrait que les organes responsables des politiques en matière de science et de technologie aient d'étroites relations de travail avec les autorités chargées de gérer et de planifier le développement social et économique, afin d'assurer que la science et la technologie s'intègrent dans les programmes de développement et d'éviter que ces activités se trouvent isolées ou déphasées par rapport aux autres objectifs nationaux de développement.

10. A cet égard, la Conférence a recommandé que la coopération dans le domaine de la recherche sur le développement ne soit pas cloisonnée mais tienne pleinement compte des interactions qu'un développement bien conçu peut déclencher entre secteurs voisins dans le contexte national et au niveau de la région. Le Groupe de travail se félicite de ces recommandations et espère qu'elles seront suivies de mesures pratiques de coopération en matière de recherche.

11. Le rapport intérimaire établi à l'issue de la première session a été amendé et complété, chaque fois que cela est apparu nécessaire, pour tenir pleinement compte des conclusions et recommandations de la seconde session. Le présent document remplace donc le rapport intérimaire.

12. Quelques communications particulièrement intéressantes, parmi celles qui ont été établies pour les sessions du Groupe de travail, sont rassemblées dans les annexes 5 à 14.

2. OBJECTIFS DE LA RECHERCHE SUR LES RESSOURCES HALIEUTIQUES, SPECIALEMENT EN CE QUI CONCERNE LES REGIONS EN DEVELOPPEMENT

13. Envisagés d'un point de vue général - à savoir l'acquisition de renseignements qualitatifs et quantitatifs sur les ressources et sur leur répartition géographique et temporelle - les objectifs de la recherche sur les ressources halieutiques peuvent sembler indépendants des caractéristiques des ressources, des conditions dans lesquelles se déroule la recherche et des objectifs de la collectivité. Cependant, à l'occasion du débat sur ce thème, les participants se sont montrés très sceptiques quant à la validité générale d'objectifs plus spécifiques de la recherche sur les ressources halieutiques. Ces objectifs peuvent en effet dépendre des trois conditions mentionnées plus haut, à savoir, les caractéristiques des ressources, les conditions et le rôle de la recherche et les objectifs de la collectivité. En phase de développement notamment, le rôle d'un chercheur n'est pas seulement celui d'un technocrate chargé de fournir des renseignements objectifs; il a aussi sa part dans l'élaboration des objectifs de la collectivité.

14. Les objectifs de la recherche empruntés aux régions pratiquant une pêche hautement industrialisée risquent donc d'être introduits dans des zones où ils ne seront peut-être pas appropriés. Par exemple, le critère largement appliqué qui consiste à "déterminer le rendement maximum équilibré" d'une ressource est à manier avec beaucoup de précaution, l'expérience ayant montré qu'il était le plus souvent impropre en tant qu'objectif d'aménagement unique. Le problème d'un pays en développement consistera peut-être, par exemple, à déterminer comment mieux utiliser des ressources qui sont déjà en partie exploitées par la

pêche artisanale. Un modèle de production simple fournira peut-être des renseignements importants en ce qui concerne les caractéristiques des rendements potentiels d'une ressource mais, par lui-même, ne donnera pas la gamme complète des données nécessaires pour prendre des décisions d'aménagement rationnelles concernant, par exemple, l'utilisation d'une ressource par ses divers utilisateurs potentiels. Les objectifs de la recherche doivent évidemment comporter une évaluation quantitative, mais qui peut prendre la forme d'une estimation de la production supplémentaire possible compte tenu des conditions actuelles de la ressource, des caractéristiques de la pêche et des objectifs visés.

15. Les objectifs et priorités de la recherche doivent, en particulier, correspondre aux objectifs de la collectivité et il faudra peut-être, dans la phase initiale de développement de la pêche, donner une priorité élevée à l'étude des disponibilités, des possibilités de capture et de la qualité des ressources.

3. THEORIES, METHODES ET MATERIEL DE LA RECHERCHE SUR LES RESSOURCES HALIEUTIQUES, EU EGARD EN PARTICULIER AUX CONDITIONS EXISTANT DANS LES PAYS EN DEVELOPPEMENT ET AU TRANSFERT DE TECHNOLOGIE

16. Les méthodes de recherche sur les ressources halieutiques ont en général été mises au point dans les régions tempérées et c'est aussi dans ces régions qu'elles sont le plus intensivement et le plus largement appliquées. Il est donc tout à fait légitime de se poser la question de leur applicabilité dans les régions tropicales et subtropicales où sont situés la plupart des pays en développement. Le Groupe de travail a examiné cette question en tenant compte à la fois des caractéristiques différentes des ressources, qui déterminent leur production dans les eaux tropicales, et des conditions différentes que la recherche trouve le plus souvent dans des pays où le développement économique, administratif et technologique est récent. Les ressources diffèrent de celles des régions tempérées par les principales caractéristiques suivantes:

- un taux de renouvellement élevé de la production et une durée de vie plus courte pour de nombreuses espèces;
- les ressources doivent, dans la plupart des cas, être évaluées, exploitées et gérées comme des entités constituées de plusieurs ou d'un grand nombre d'espèces différentes;
- la reproduction s'effectue en général sur une période de temps plus longue et un espace plus vaste que dans les régions tempérées;
- des caractéristiques de croissance avec cycles saisonniers de faible amplitude.

17. En outre, il peut être particulièrement difficile de tirer des pêcheries existantes des données concernant les ressources (petite pêche et pêche artisanale opérant avec un très grand nombre d'unités, ou développement récent de la structure administrative nationale) et, par conséquent, celles-ci sont souvent moins significatives que les données rassemblées auprès de pêcheries plus organisées. Dans certaines régions en développement, une partie des ressources n'est pas exploitée et les statistiques les concernant n'existent donc pas. D'autre part, les efforts de recherche se sont concentrés sur un petit nombre d'espèces et ont laissé de côté une proportion non négligeable des ressources, en particulier les captures accessoires et les espèces rejetées. Cet état de fait nuit à l'évaluation et à la surveillance rationnelles des ressources halieutiques exploitées et latentes. On manque aussi d'une façon générale de données économiques et sociales (main-d'oeuvre).

18. Cette situation est d'autant plus regrettable que, même dans les pays ayant des capacités de recherche limitées, il est possible de recueillir des renseignements extrêmement précieux auprès des pêcheries existantes. Les gouvernements sont encore loin d'en avoir pris conscience et l'insuffisance des statistiques nationales - du point de vue du champ couvert, de la précision et de la fiabilité - reste un frein important à la réalisation d'un diagnostic fiable sur l'état des stocks.

19. Par conséquent, quels que soient les moyens que les pays peuvent consacrer à la recherche halieutique, ils devraient tous créer, sur des bases solides, des structures adéquates pour la collecte ordinaire et la mise en mémoire de statistiques sur les pêches, lesquelles devraient inclure des données sur les captures et sur l'effort de pêche des principales pêcheries et, dans la mesure des besoins et du possible, des renseignements sur les espèces et la composition par taille des captures. La conception du système d'échantillonnage nécessaire et son perfectionnement périodique exigeront parfois l'intervention pendant de courtes périodes de spécialistes étrangers, mais son fonctionnement normal ne devrait guère entraîner d'autres charges que le recrutement et le financement d'enquêteurs en nombre suffisant et dûment qualifiés. Chaque pays serait ainsi assuré de disposer des informations de base nécessaires à l'évaluation périodique de l'état des stocks et des pêcheries qui en dépendent; l'administration et les industries nationales pourraient veiller à leur gestion en connaissance de cause.

20. Les implications, du point de vue des méthodes scientifiques et de leur applicabilité, des caractéristiques particulières des pêches tropicales et des conditions de fonctionnement de la recherche dans les pays en développement sont considérables. Le modèle monospécifique qui est si largement appliqué dans les pêcheries des zones tempérées ne peut être utilisé que de manière très sélective. Etant donné la courte durée de vue et les problèmes de détermination de l'âge, les modèles analytiques n'ont qu'une application limitée si l'on ne procède pas à des ajustements spéciaux. Les modèles simplifiés de production globale doivent aussi être adaptés et appliqués. Lorsque l'on se trouve en présence de stocks dont la production connaît des fluctuations importantes d'une année sur l'autre, la surveillance de la biomasse au moyen d'études est parfois le seul moyen d'obtenir des renseignements significatifs aux fins d'aménagement. L'étude des oeufs et des stades larvaires ne seront généralement pas utilisées, mais les pêches de prospections et les prospections associant les méthodes acoustiques et la pêche seront souvent indispensables pour avoir des estimations de la biomasse totale dont on pourra déduire les rendements potentiels. Souvent aussi, on pourra utiliser les informations disponibles sur les conditions océanographiques et la productivité primaire et secondaire pour en tirer des indices comparatifs de productivité des stocks.

21. Le Groupe de travail note également qu'il faut mettre au point des méthodes et des techniques appropriées pour l'étude des ressources des zones tropicales, à savoir détermination de l'âge par décompte des anneaux journaliers, systèmes d'échantillonnage statistique pour les pêches artisanales, adaptation des techniques de prospections acoustiques aux conditions tropicales, mise au point d'indices de productivité par types de communautés et d'environnements halieutiques, etc. Etant donné les ressources limitées dont dispose la recherche et les conditions de travail difficiles, les techniques et le matériel de base doivent être aussi simples que possible. Des études sur les ressources halieutiques relativement rudimentaires, si elles sont bien conçues et bien menées, peuvent déjà fournir une grande quantité de renseignements essentiels.

22. Dans la mesure où l'on ne dispose que de séries chronologiques courtes sur les caractéristiques des ressources halieutiques dans les eaux tropicales, on ne dispose pas non plus de beaucoup d'informations sur les grands problèmes présentant un intérêt général pour la gestion de ces ressources, à savoir les fluctuations à long terme des stocks et les rapports stocks-recrutement, l'élasticité des stocks soumis à la pêche, les interactions entre stocks, etc. Les décisions concernant la gestion de ces ressources n'en sont que plus difficiles et il faut donc agir avec davantage de prudence. Avec les progrès de la science, l'étude systématique de ces problèmes de recherche devrait rapidement améliorer le niveau de nos connaissances. Pour favoriser au maximum ce processus, il faudrait envisager de faire des bilans spéciaux des problèmes et études concernant les ressources halieutiques tropicales et subtropicales.

23. Le Groupe de travail a aussi noté que non seulement la recherche sur les ressources halieutiques a été négligée dans de nombreux pays en développement mais aussi que les résultats des travaux effectués sont souvent peu diffusés et mal connus. Cela tient principalement à ce que les résultats des recherches provenant de ces régions sont rarement publiés.

Le Département des pêches de la FAO devrait étudier la possibilité de créer des bulletins scientifiques régionaux afin de promouvoir la diffusion des résultats de recherche dans ces zones.

4. SITUATION DE LA RECHERCHE SUR LES RESSOURCES HALIEUTIQUES DANS LES PAYS EN DEVELOPPEMENT

4.1 Etude effectuée dans quelques pays

24. A sa première réunion, le Groupe de travail a décidé qu'une étude devait être entreprise en vue de réunir des renseignements sur le nombre d'halieutistes dans les pays en développement, le niveau de leur études et de leur formation, l'étendue des moyens (disciplines scientifiques couvertes), les resources financières et les installations disponibles (notamment les navires de recherches), la place de la recherche dans l'administration ou l'organisation institutionnelle, ses liens avec les utilisateurs des résultats de la recherche et l'engagement financier global consenti à la recherche halieutique (évaluation des ressources) par rapport à la valeur ex-navire des captures. Reconnaissant qu'une enquête générale de cette nature ne pouvait être entreprise pour tous les pays en développement dans les délais disponibles, celle-ci devait donc être conçue pour un certain nombre de pays producteurs d'Afrique, d'Amérique latine et d'Asie.

25. L'étude a été réalisée par le Secrétariat de la FAO au moyen d'un questionnaire. Le champ couvert par l'enquête était malheureusement loin d'être complet mais certains de ses résultats donnent des indications utiles et intéressantes.

Les pays suivants ont répondu au questionnaire:

Afrique: Algérie, Côte-d'Ivoire, Ghana, Maroc, Mauritanie, Mozambique, Sénégal, Sierra Leone, Tanzanie, Seychelles;

Asie: Inde, Malaisie, Philippines, République démocratique populaire du Yémen;

Amérique latine: Argentine, Colombie, Cuba, Equateur, Jamaïque, Uruguay;

Océanie: Nouvelle-Guinée

Méditerranée: Chypre[1].

Soit au total 22 pays en développement.

Arrangements institutionnels

26. Ceux-ci ont généralement été décrits de façon détaillée, mais aux fins de la présente analyse, deux modèles de base ont été retenus, à savoir: arrangements internes, dans lesquels l'unité de recherche fait partie de l'administration des pêches, et arrangements externes, dans lesquels la recherche est placée sous la responsabilité d'une autre institution, par exemple une université, un conseil de recherche, etc.

27. Les réponses se répartissent comme suit:

	Arrangements internes	Arrangements externes
Afrique	7	3
Asie	2	1
Amérique latine	6	0

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[1] Plus l'Algérie et le Maroc qui sont cités dans la région "Afrique"

Possibilités de formation universitaire auprès d'établissements nationaux

28. Le nombre d'établissements nationaux proposant une formation de base, au niveau universitaire, pour les halieutistes est le suivant:

Pour les pays d'Afrique ayant répondu au questionnaire: 10
Pour les pays d'Asie ayant répondu au questionnaire: 11
Pour les pays d'Amérique latine ayant répondu au questionnaire: 13

Le nombre de spécialistes recrutés par les établissements de recherche halieutique ayant reçu leur formation universitaire soit dans leur pays, soit à l'étranger se répartit comme suit:

	Etablissements nationaux	Etablissements étrangers	Rapport N/E
Afrique	27	57	0.5
Asie	221	10	22
Amérique latine	217	22	10

Effectifs

29. Le nombre de chercheurs par spécialité et le nombre de techniciens se répartit comme suit (moyenne par région):

	Spécialistes de la biologie des ressources	Spécialistes de l'environnement et de la pollution	Divers	Total	Techniciens
Afrique	6.5(58%)	3.4(30%)	1.5(12%)	11.2(100%)	10
Asie	83 (62%)	28 (21%)	22 (17%)	134 (100%)	117
Amérique latine	30 (60%)	10 (20%)	10 (20%)	50 (100%)	32

Coûts de la recherche

30. Le coût total de la recherche, en pourcentage de la valeur au port des captures est évalué comme suit:

	Fourchette (%)	Moyenne (%)
Afrique	0.3-2.5	1.0
Asie	0.1-3.0	1.0
Amérique latine	0.5-3.0	2.0

Observations

30. Avant de commenter ces résultats, on a fait remarquer que ces chiffres ne sont pas directement comparables. Ils dépendent d'un grand nombre de facteurs. Par exemple, indépendamment de la taille des pêcheries nationales ou du niveau de développement économique général du pays, on pourrait s'attendre à ce que de grands pays comme l'Inde soient en mesure de couvrir une gamme plus large de disciplines. A cet égard, les statistiques condensées communiquées pour l'Asie rendent compte surtout de la situation dans les grands pays et ne reflètent pas très précisément ce qui se passe dans les petits pays du même continent. Il est donc difficile de comparer ces chiffres à ceux de l'Afrique, où les pays ayant répondu au questionnaire sont en général moins importants, sur le plan géographique et sur le plan économique.

32. Malgré leurs limitations, les données de l'enquête indiquent que dans plus de trois quarts des pays étudiés, les recherches sur les ressources halieutiques relèvent d'un organisme spécial faisant partie de l'administration nationale des pêches. Dans quelques pays d'Afrique et d'Asie seulement, l'unité de recherche s'intègre dans un conseil général de la recherche ou autre organe similaire.

33. Dans toutes les régions, les pays inclus dans l'enquête possèdent un nombre non négligeable d'établissements d'enseignement offrant une formation dans des domaines intéressant la science halieutique. De même, les données concernant l'origine de la formation professionnelle du personnel recruté par les organismes de recherche indiquent qu'il est fait usage des capacités de formation existantes. Il y a cependant des différences très importantes entre les régions, puisque dans les pays d'Afrique ayant répondu au questionnaire, un tiers seulement des spécialistes sont formés dans des établissements nationaux tandis qu'en Asie et en Amérique latine, la proportion est au moins de 90 pour cent.

34. En ce qui concerne le nombre de chercheurs travaillant sur les ressources halieutiques, on relève aussi une nette différence entre les régions. Par pays, les chiffres ne sont peut-être pas très significatifs dans la mesure où les superficies sont très différentes, mais on constate une pénurie de chercheurs dans les pays africains par rapport à l'Asie et à l'Amérique latine. La proportion entre les diverses catégories énumérées montre que la répartition entre les disciplines est raisonnable.

35. Les coûts de la recherche, en pourcentage de la valeur estimative des quantités débarquées, accusent un écart important entre les pays, écart qui va de 0,1 à 3 pour cent. Une estimation similaire pour l'Atlantique du nord-est, d'après une enquête de 1974[1/], donnait une fourchette de 0,5 à 3,7 pour cent, et une moyenne de 2 pour cent pour 9 pays de l'Europe de l'Ouest. A titre de comparaison, la moyenne est de 1 pour cent pour les pays d'Afrique et d'Asie et de 2 pour cent pour les pays d'Amérique latine. Cependant, la plupart des pays en développement devraient avoir un potentiel de développement halieutique relativement élevé et l'importance de leurs ressources est sans doute sous-estimée si l'on considère la valeur au port de leurs captures actuelles. En admettant que les pays de l'Atlantique nord-est consacrent des crédits suffisants à la recherche sur les ressources, on peut conclure que, d'une manière générale, les dépenses des pays en développement inclus dans l'enquête sont insuffisantes.

36. Le Groupe de travail conclut que l'étude a apporté quelques renseignements sur la question. Il faudrait toutefois s'efforcer d'obtenir des données plus complètes et plus représentatives car ces évaluations peuvent fournir des orientations importantes lorsqu'il s'agit de définir des politiques et des priorités.

4.2 Organisation de la recherche au niveau national

37. Le Groupe de travail a étudié plus en détail l'insertion administrative de la recherche sur les ressources halieutiques au sein de la structure gouvernementale responsable de la formulation et de l'application des politiques de développement et d'aménagement des pêches. Comme le montre l'étude mentionnée plus haut, dans la majorité des pays la recherche halieutique est assurée par un service, un département ou un institut qui fait partie intégrante de l'administration chargée d'élaborer et d'exécuter les politiques halieutiques, le directeur de la recherche relevant directement du chef administratif du Département des pêches. Dans certains pays, la recherche s'effectue dans un laboratoire ou un institut intégré dans un organisme de recherche plus vaste qui couvre en général tout le secteur agricole. Dans d'autres pays, la recherche sur les ressources halieutiques relève d'un organisme national de la recherche (ou éventuellement d'un ministère) dont les compétences couvrent de nombreux secteurs de l'économie. Dans plusieurs pays, les facultés universitaires participent aux études sur les ressources halieutiques.

38. Le Groupe de travail estime que les échanges d'informations entre halieutistes et administrateurs des pêches sont considérablement facilités s'il existe des relations institutionnelles aussi étroites que possible entre la recherche sur les ressources halieutiques et

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[1/] Saetersdal, G. A note on the state of fishery research in the Northeast Atlantic. Dans
1975 le Suppl. 1 au Rapport de la huitième session du CCRRM, Sesimbra, Portugal, 8-12 septembre 1975. FAO Fish.Rep.,(171) Suppl.1:136

l'administration des pêches, aussi est-il préférable de placer la recherche sur les ressources au sein du Département national des pêches. Cet arrangement facilite aussi la mise en place et le bon fonctionnement de systèmes statistiques efficaces. Comme les halieutistes sont les principaux utilisateurs des statistiques sur les pêches, ils peuvent contribuer à la conception des programmes d'échantillonnage et aider à former les enquêteurs de terrain. Enfin, ces arrangements permettent aux halieutistes d'utiliser le réseau provincial du Département des pêches pour se tenir en contact avec le secteur des pêches et s'informer directement de toutes modifications des pratiques de pêche qui pourraient se répercuter, par exemple, sur l'efficacité des opérations et, par conséquent, sur l'estimation de l'effort de pêche.

39. Il y a des raisons historiques qui expliquent que, dans chaque pays, la recherche halieutique soit située à tel ou tel endroit mais, dans l'ensemble, que le pays soit grand ou petit et quelle que soit l'importance des ressources halieutiques, l'existence de liens étroits entre la recherche sur les ressources et l'administration des pêches garantit que les politiques seront fondées sur des renseignements et des avis sûrs. Cela devient particulièrement important à mesure que l'exploitation des ressources s'étend et que le nombre de pêcheries aménagées augmente. Quelle que soit la solution retenue pour organiser le cadre institutionnel, il faudra prévoir les liaisons appropriées pour que des communications satisfaisantes s'instaurent avec l'administration ou la recherche en dehors de ce cadre officiel; pour cela, on pourrait recourir notamment à la création de comités consultatifs permanents.

40. En tout état de cause, le Groupe de travail souligne que si étroits que puissent être ces liens, ils ne doivent pas compromettre l'indépendance de l'organisme de recherche sur le plan scientifique et en matière de fonctionnement interne. En fait, l'autonomie dont ont besoin les organismes de recherche halieutique pour mettre au point leurs programmes de recherche à long terme conditionne leur aptitude à fournir aux administrateurs, entrepreneurs et pêcheurs les conseils scientifiques grâce auxquels il pourront établir des plans cohérents de développement et d'aménagement à long terme.

41. Bien que l'insertion de l'unité de recherche au sein de l'administration des pêches soit généralement considérée comme positive, il arrive, dans certains cas, qu'elle ait des effets secondaires négatifs. Ce type d'organisation engendre parfois une situation où les spécialistes de la recherche jouissent de conditions moins favorables que dans d'autres instituts de recherche du pays, dans les universités par exemple. Cette situation est préjudiciable au recrutement et à la stabilité de chercheurs de bon niveau. Les conditions de travail dans les laboratoires de l'Etat doivent mettre ces établissements à même de soutenir la concurrence avec les universités et les autres instituts nationaux sur le plan du recrutement du personnel scientifique approprié.

42. Une coopération active doit s'instaurer entre les laboratoires de recherche halieutique et les facultés universitaires qui travaillent dans des domaines connexes. Cette coopération assure que l'enseignement des disciplines halieutiques dispensé à l'université est adapté et correspond aux besoins des pêches nationales et aux progrès de la science. Les halieutistes peuvent utilement contribuer à l'enseignement et aux conférences assurés dans le cadre universitaire et post-universitaire. De même, des contacts étroits entre la recherche et l'enseignement supérieur peuvent aider l'université dans ses recherches, et réciproquement favoriser une meilleure compréhension des ressources halieutiques du pays.

43. Outre les contacts étroits avec les organismes travaillant dans les mêmes disciplines, il faut aussi qu'il y ait un contact avec d'autres domaines apparentés comme la technologie de la pêche et la transformation du poisson, la nutrition humaine, les sciences sociales, l'économie. La structure et les arrangements organisationnels doivent viser à faciliter ces contacts.

4.3 Arrangements régionaux et coopération technique entre pays en développement

44. Les organes régionaux des pêches offrent à leurs états membres un dispositif dans le cadre duquel aborder les problèmes que posent l'exploitation des stocks internationaux partagés, en particulier la promotion et la coordination des études d'évaluation des ressources et la préparation et la négociation de programmes d'aménagement. A cet égard, le

Groupe de travail note que les organes des pêches créés par la FAO dans la plupart des zones tropicales et sous-tropicales jouent un rôle croissant à mesure que se développent les capacités scientifiques des états membres (annexe 6). Il se félicite de la création par la FAO, avec l'appui du PNUD et d'autres donateurs multilatéraux et bilatéraux, de programmes régionaux de terrain, destinés à servir d'unités de soutien technique auxdits organes régionaux des pêches. Bien que le rôle de ces organes régionaux soit affecté par l'actuelle transformation du droit de la mer, il restera essentiel dans les régions où le nombre de stocks partagés est important, notamment pour la compilation et l'échange de statistiques halieutiques, l'organisation de groupes de travail conjoints pour l'évaluation des stocks, l'analyse et l'élaboration d'éventuels programmes d'aménagement.

45. Dans toutes les régions, ces organes régionaux resteront extrêmement utiles pour faciliter et promouvoir la coopération régionale, en particulier entre pays en développement. La participation de jeunes chercheurs à des groupes de travail régionaux semble être un des moyens les plus efficaces pour accomplir leur formation. En facilitant les échanges de vues et d'expériences, l'examen critique des résultats de recherche par la communité scientifique, la sélection des priorités de la recherche et la mise en commun de programmes de recherche, la collaboration régionale est, de l'avis du Groupe de travail, la solution la plus efficace pour améliorer de façon continue les compétences nationales. Cet effort doit être poursuivi et renforcé.

46. Le Groupe de travail a aussi insisté sur l'intérêt de la coopération scientifique et technique entre pays en développement pour promouvoir l'utilisation et le développement de leurs propres capacités et institutions. Les organes régionaux s'occupant des pêches et autres activités économiques sont des instruments efficaces pour promouvoir ces activités, mais les pays en développement ont encore diverses possibilités de développer directement leur collaboration. A cet égard, on a cité plusieurs exemples de coopération bilatérale dans le domaine de la recherche halieutique: Cuba/Guyane, Cuba/Mexique, Indonésie/Thaïlande, Indonésie/Malaisie, Côte-d'Ivoire/Ghana, etc. Cependant, les possibilités de CTPD se heurtent souvent au manque de fonds en particulier de devises étrangères. Le Groupe de travail estime que les pays en développement doivent eux-mêmes engager à cet effet des crédits suffisants, prélevés notamment sur les budgets multilatéraux et bilatéraux gérés au plan national.

5. RESSOURCES NECESSAIRES A LA RECHERCHE HALIEUTIQUE

5.1 Effectifs

47. Le Groupe de travail a étudié la question des effectifs nécessaires à l'exécution des programmes de recherche sur les ressources halieutiques et considère qu'il existe une "masse critique" minimum sans laquelle il n'est pas possible de mener une véritable recherche sur les ressources et de donner des avis utiles sur les mesures à prendre en matière de développement et d'aménagement. Etant donné la diversité des espèces peuplant les écosystèmes tropicaux et la diversité des questions qui se posent, le minimum requis pour entreprendre de façon indépendante des programmes de recherche halieutique relativement complets serait de sept à dix scientifiques, la qualité des chercheurs important plus que leur nombre.

48. Dans nombre de petits pays, et dans les pays ayant des ressources halieutiques relativement limitées, le nombre de spécialistes sera sans doute faible et c'est pourquoi il est particulièrement important qu'il participent à des groupes de travail, séminaires et autres activités organisés à l'échelon régional pour accroître leurs connaissances, leur compétence et leur efficacité.

49. Dans certains pays, le recrutement et la sélection de chercheurs ayant les qualités requises posent un véritable problème, qui tient à la disparité des salaires et des conditions d'emploi entre les départements des pêches d'une part et les universités et parfois même d'autres départements ministériels comme l'agriculture et l'élevage, ainsi que le secteur privé d'autre part. Afin de pouvoir compter sur un personnel suffisant et qualifié, le Groupe de travail recommande que l'on assure aux chercheurs la parité de traitement à cet égard, et notamment le respect d'une certaine liberté dans la poursuite de recherches (dans les limites des responsabilités de chacun) et leur rémunération.

50. Quand on met au point des programmes de personnel, il faut prévoir non seulement des scientifiques mais aussi le personnel nécessaire à l'utilisation des navires de recherches, des installations d'entretien à terre et du matériel perfectionné tel qu'appareils acoustiques et ordinateurs. On a souligné la nécessité pour la FAO de soutenir ces programmes. Comme les activités de formation dans des domaines hautement spécialisés (statistiques des pêches, évaluation des stocks, prospections, aménagement, aquaculture, etc.) doivent souvent être organisées dans une optique régionale, le Groupe de travail estime que les projets régionaux de la FAO ont une responsabilité majeure dans le choix et la préparation de ces stages et la mobilisation du financement nécessaire.

5.2 Matériel

51. Certaines recherches en mer demandent un matériel extrêmement perfectionné, mais le Groupe de travail fait observer qu'un travail extrêmement utile pour l'évaluation des ressources peut être fait avec très peu de matériel, en utilisant les statistiques provenant des pêcheries commerciales et les renseignements sur la taille et autres caractéristiques des poissons que l'on peut se procurer, sans navire de recherches, sur les marchés et à bord des navires de pêche commerciaux. Ce travail ne nécessite guère plus qu'une planche à mesurer, un microscope et une calculatrice. Cependant, si les ressources sont importantes et si la collecte de statistiques halieutiques détaillées présente des carences graves qui ne peuvent être rapidement surmontées, l'emploi de navires de recherches devient indispensable.

52. Même les ordinateurs, de plus en plus nécessaires pour traiter de grandes quantités de données brutes, deviennent accessibles à des prix raisonnables et, grâce aux progrès accomplis dans le domaine des calculatrices de bureau, de nombreux instituts halieutiques des pays en développement peuvent maintenant acquérir leur propre matériel. Le Groupe de travail considère cette évolution comme importante car elle permet de réduire les délais de traitement des données et de familiariser les halieutistes avec l'emploi de ce matériel.

53. Lorsque l'évaluation des ressources pélagiques exige un matériel acoustique perfectionné que le pays n'est pas en mesure d'acheter ou d'entretenir, il devra chercher à mettre au point des programmes de coopération avec des pays possédant ces équipements et les compétences requises pour leur utilisation.

54. Enfin, on a fait observer que, dans plusieurs pays en développement, les bibliothèques spécialisées dans la recherche sur les ressources halieutiques sont dans un état déplorable, voire inexistantes. Cette situation rend très difficile le développement de la recherche halieutique. Chaque centre de recherche doit avoir un fonds de bibliothèque constitué de livres, de manuels et de revues scientifiques sur la pêche. En outre, il est indispensable de pouvoir se référer rapidement à une documentation scientifique à jour en matière de systématique, notamment en ce qui concerne les critères d'identification des poissons et les différentes études portant sur la biologie des ressources, en particulier celles qui intéressent la zone ou la région à laquelle le pays appartient, ainsi que sur les principales méthodes d'évaluation des ressources.

5.3 Coûts et financement

55. Le Groupe de travail reconnaît que les coûts de la recherche sur les ressources halieutiques sont extrêmement variables. Si les navires de recherches représentent un lourd investissement, leurs coûts de fonctionnement sont également très élevés, ce qui rend leur pleine utilisation particulièrement difficile pour les petits pays, même si ces navires leur sont fournis à titre de don dans le cadre de programmes d'assistance. Quand un pays donateur fournit des biens d'équipement très coûteux, comme un navire de recherches, il devrait aussi mettre à disposition des crédits supplémentaires pour l'entretien du navire pendant un certain nombre d'années. Le Groupe de travail recommande aussi que l'on étudie la possibilité de créer des services de navires de recherches sur une base régionale.

56. Le Groupe de travail a examiné les renseignements contenus dans les communications et documents de travail concernant le financement. Il apparaît que l'insuffisance des crédits est une des principales limitations de la recherche sur les ressources dans la plupart des pays en développement. On a cité l'exemple de pays ou de régions où de véritables progrès, rendus possibles en partie grâce à un soutien extérieur (projets d'assistance à des pays ou régions) se sont dégradés dès que le financement extérieur a pris fin.

57. Il est urgent pour les pays en développement d'accroître le volume et la qualité de leur recherche sur les ressources. Pour y parvenir, les gouvernements doivent reconnaître qu'il faut augmenter sensiblement le financement. Il serait bon que l'industrie de la pêche contribue à la recherche sur les ressources mais le Groupe de travail insiste sur le fait que ce type de financement doit passer par le gouvernement et non aller directement à l'institut concerné et que les résultats de la recherche soient accessibles à tous.

6. PROJETS D'AIDE A LA RECHERCHE SUR LES RESSOURCES HALIEUTIQUES

58. Le Groupe de travail a passé en revue les réalisations, les problèmes et les échecs des projets de recherche et de formation compte tenu des analyses effectuées entre les deux sessions. Les résultats de projets d'aide, tant bilatéraux que multilatéraux, réalisés dans onze pays (annexes 5, 8, 11, 12 et 13) ont été analysés par des personnes étroitement associées aux pays bénéficiaires et aux organisations d'assistance. Pour étudier ce sujet, le Groupe de travail a estimé qu'il convenait d'examiner séparément les projets nationaux et interpays mais qu'il n'était pas nécessaire d'évaluer indépendamment les projets financés de façon bilatérale ou de sources multilatérales car leurs besoins et contraintes étaient similaires.

6.1 Projets nationaux

6.1.1 Elaboration et planification des projets

59. Fondamentalement, la plupart des projets de recherche visent deux objectifs principaux: (i) l'exécution d'un programme de recherches déterminé et (ii) la formation de personnel national de recherche. L'importance relative accordée à ces deux aspects varie d'un projet à l'autre mais, en général, on s'attache d'abord à la réalisation du premier objectif.

60. D'une manière générale, il y a convergence entre les diverses évaluations présentées au Groupe de travail concernant les résultats atteints par les projets d'assistance. Dans les limites de leurs objectifs immédiats et compte tenu de leur champ d'application, les projets ont convenablement cerné les priorités - la plupart concerne l'inventaire des ressources et leur évaluation quantitative - et identifie les mesures correspondantes (mise au point et application de méthodes - y compris de prospections - pour l'évaluation des ressources). La plupart des projets ont donc efficacement contribué à l'acquisition de données qualitatives et quantitatives sur les ressources et, grâce à la formation en cours d'emploi et à l'octroi de bourses de perfectionnement, à la formation d'un grand nombre d'halieutistes dans les pays en développement.

61. Pourtant, l'impact de ces projets sur le développement et, plus encore, sur l'aménagement des pêches nationales a été, dans l'ensemble, loin d'être satisfaisant. Trop souvent en outre, leur contribution au renforcement des institutions et structures nationales n'a pas eu les effets durables que l'on était en droit d'espérer.

62. Les causes de ces insuffisances sont nombreuses et difficiles à isoler de manière objective. Le développement est un processus extrêmement complexe (annexe 8), et il n'est pas aisé de faire un rapprochement direct entre les causes et les effets et, en particulier, entre les progrès du développement et les apports des projets de terrain. Dans plusieurs pays, les administrations nationales ne sont pas parfaitement conscientes des possibilités offertes par les pêches nationales ni des exigences - en particulier en ce qui concerne les besoins de la recherche - d'un développement et d'un aménagement rationnels. On ne prête pas suffisamment attention à l'élaboration de politiques globales à long terme pour la pêche

et la recherche et à la nécessité d'intégrer de façon harmonieuse les projets sectoriels dans les plans d'ensemble. C'est en effet le manque de continuité qui apparaît comme l'une des principales faiblesses de la majorité des projets. A ce manque de continuité correspondent des engagements financiers trop courts de la part des organismes d'assistance et des changements imprévus d'attitude des gouvernements vis-à-vis des objectifs des projets.

63. Ces insuffisances sont extrêmement préjudiciables au renforcement des capacités scientifiques nationales et à la mise en place de structures institutionnelles. Des programmes de recherches déterminés peuvent être menés avec succès dans les délais généralement impartis à la plupart des projets de terrain - généralement, quelques années - mais le développement des capacités nationales de recherche et des institutions est un processus qui se déroule obligatoirement sur une période de temps beaucoup plus longue que la durée normale des projets du PNUD et de la plupart des projets bilatéraux.

64. A l'annexe 8, l'auteur souligne la supériorité des projets "orientés en fonction d'un programme" sur les projets "orientés en fonction d'un objectif", c'est-à-dire des projets qui visent à aider les pays à mettre en place certaines capacités et structures plutôt qu'à exécuter un ensemble précis de travaux de recherche. Cette distinction n'est peut-être pas aussi déterminante si les données nécessaires au développement et à l'aménagement rationnels des ressources halieutiques nationales, les moyens indispensables à ce développement et les efforts à déployer pour les mobiliser - notamment le rôle imparti à l'aide extérieure - sont correctement définis et planifiés.

65. On fait observer, dans ce même document, que dans plusieurs pays, la pratique de l'halieutique ne dépasse guère le stade de l'application automatique de modèles d'évaluation quantitative des stocks et ne prête pas suffisamment attention aux aspects plus larges du comportement des écosystèmes et de la viabilité à long terme des stocks; cette remarque peut s'expliquer, entre autres, par le fait que, dans la plupart des pays en développement, les équipes de recherche commencent juste à se constituer. On ne peut donc pas s'attendre à ce qu'elles maîtrisent immédiatement les aspects complexes des problèmes halieutiques envisagés dans leur contexte le plus large. Cependant, à mesure que ces équipes amélioreront la formation et gagneront en expérience - ce qu'elles feront plus efficacement si elles concentrent leurs efforts sur les problèmes les plus immédiats, les plus concrets et les plus faciles à résoudre en matière de développement et d'aménagement des pêches - on peut penser qu'elles étendront progressivement leur champ d'activité et accorderont plus d'attention aux multiples complexités de l'écologie marine.

66. L'effet limité que plusieurs projets d'assistance ont eu sur le développement des pêches nationales est peut-être imputable, dans une certaine mesure, à la difficulté de communiquer avec l'administration et l'industrie ainsi qu'à une planification trop restreinte de l'aide à fournir. Les projets de recherche halieutique sont souvent mis au point et exécutés sans que soient suffisamment pris en compte les autres aspects du développement des pêches (technologie de la pêche, transformation du poisson, commercialisation, etc.) et de la recherche (biologie marine en particulier). L'exemple du programme bilatéral Thaïlande/République fédérale d'Allemagne (annexe 12) et celui de l'aide multilatérale à Cuba (annexe 11) montrent qu'une planification globale et à long terme permet en fait d'obtenir des effets plus étendus et plus durables.

67. A mesure que se renforceront les capacités de planification des pays bénéficiaires, qui sont maintenant responsables, au premier chef, de l'utilisation des fonds provenant de l'assistance internationale, et que les organismes d'assistance acquerront une plus grande expérience des conditions et des besoins locaux, ces insuffisances devraient pouvoir être péliminées. A cet égard, les instances nationales chargées de la planification ont un rôle important à jouer pour assurer une bonne coordination et une répartition correcte des programmes d'assistance financés par différentes sources, bilatérales ou multilatérales.

6.1.2 Exécution des projets

68. Dans le cas de certains projets, il a été difficile d'atteindre correctement et simultanément les deux objectifs fondamentaux mentionnés plus haut, à savoir l'exécution de travaux de recherche et le renforcement des capacités de recherches. Dans une large mesure, le résultat a été fonction du personnel affecté au projet. Certains projets ont mis l'accent sur la réalisation de travaux scientifiques et n'ont pas toujours pleinement associé les institutions et homologues nationaux aux diverses activités de recherche. D'autres ne se sont pas suffisamment intégrés dans les structures et institutions nationales auxquelles ils étaient rattachés. Cela n'a pas facilité le dialogue entre le personnel national et le personnel étranger du projet et a eu des effets néfastes sur la façon dont les institutions nationales ont accueilli le projet. Le Groupe de travail note à ce propos que les responsables internationaux et les directeurs nationaux doivent tout particulièrement veiller à ce que s'instaurent de bonnes relations et un esprit de collaboration entre les experts internationaux et leurs homologues nationaux, et entre le projet et l'administration nationale. Le Groupe de travail estime que cette fonction est aussi importante que leurs compétences scientifiques.

69. On enregistre souvent des retards importants dans l'envoi des experts et du matériel et dans l'exécution des projets en général. Le Groupe de travail recommande de veiller à éviter ces retards.

6.1.3 Experts

70. Les compétences des experts internationaux sont considérées comme un des principaux facteurs de succès ou d'échec des projets de terrain. Ces experts doivent conjuguer toutes sortes de qualifications: capacités techniques et linguistiques, facultés d'adaptation et aptitude à travailler avec des personnes de cultures différentes, etc. De tels critères expliquent la pénurie d'experts que l'on observe souvent. A cela il faut ajouter la réticence, souvent constatée, des spécialistes à se rendre à l'étranger, et dont l'une des raisons est peut-être qu'il s'agit souvent de fonctionnaires auxquels les organisations internationales n'offrent pas la sécurité d'emploi dont ils bénéficient normalement dans leur cadre d'origine. Ils perdent parfois cette sécurité lorsqu'ils travaillent temporairement pour des organisations internationales. La situation pourrait s'améliorer si les gouvernements et les administrations nationales assouplissaient les conditions régissant les congés et les détachements.

71. Le recrutement des experts nationaux (homologues) soulève des difficultés similaires. Ceux-ci sont souvent choisis plutôt en fonction de leurs aptitudes linguistiques que de leur formation scientifique ou de leurs responsabilités futures. Il faut apporter beaucoup de soin à leur sélection et à la planification à long terme de leur carrière. Il est essentiel aussi de superviser leurs activités; le responsable national et les experts internationaux ont le devoir de mettre au point et d'appliquer des méthodes destinées à évaluer les progrès et les difficultés des experts nationaux.

72. Dans certains pays, la pénurie d'homologues nationaux ayant les compétences requises pour un projet donné est courante. Il peut y avoir diverses causes à cela, par exemple un manque généralisé de personnel qualifié dans le pays, la priorité accordée à d'autres secteurs pour l'utilisation des compétences disponibles, etc. Parfois, le nombre d'homologues nécessaires pour un projet déterminé est trop ambitieux pour le pays. La décision d'entreprendre le projet peut cependant être maintenue si les résultats du projet sont essentiels au développement des pêches nationales. S'il faut donner une importance moindre à l'élément formation du projet de terrain, le gouvernement et l'organisme d'assistance doivent étudier et préciser ce point au moment de l'élaboration du projet.

6.1.4 Equipement

73. On a souvent constaté des retards excessifs dans la livraison du matériel et des pièces de rechange, qui risquent de perturber gravement le respect du calendrier du projet. Cependant, comme on l'a déjà noté, et sauf dans le cas des navires de recherche et du matériel

dont ils sont équipés - instruments de prospection acoustique par exemple - il n'est pas indispensable d'avoir beaucoup de matériel perfectionné pour les études d'évaluation des ressources. Les équipements coûteux sont plutôt le fait d'autres disciplines, comme les études sur la pollution ou l'océanographie, et c'est là que l'absence de matériel adéquat peut dans certaines conditions devenir un facteur limitatif. Pour faciliter le choix du matériel et en accélérer la livraison, il faudrait que la FAO établisse et mette régulièrement à jour des catalogues complets des instruments les plus couramment utilisés dans la recherche sur les ressources halieutiques.

74. On a fait observer qu'il existe dans certains pays en développement une tendance à acquérir du matériel perfectionné qui ne correspond pas toujours à leurs capacités actuelles d'utilisation. Non seulement, ce matériel accroît les coûts du projet, mais il pose aussi d'autres problèmes, d'entretien et de réparation par exemple, le pays n'ayant pas toujours les moyens et installations nécessaires.

75. En ce qui concerne les navires de recherches, le Groupe de travail reconnaît que, les travaux de prospection prenant une importance croissante dans le contrôle et l'évaluation des ressources halieutiques, ceux-ci sont de plus en plus nécessaires. Cependant, plusieurs instituts de recherche ont éprouvé d'énormes difficultés à faire face aux frais de fonctionnement et d'entretien des navires qu'ils ont achetés ou obtenus dans le cadre de programmes d'assistance. L'achat de navires de recherches doit faire l'objet d'un examen des plus attentifs, tenant compte des ressources tant financières qu'humaines que suppose leur utilisation ultérieure.

6.1.5 Suivi des projets

76. Les réalisations des projets doivent être évaluées avec davantage de rigueur, tant par le pays bénéficiaire que par l'organisme d'assistance. Les vérifications auxquelles on procède après la fin du projet devraient de préférence inclure des personnes qui n'ont pas participé aux activités du projet. Etant donné la lenteur du développement des capacités scientifiques, une deuxième évaluation devrait si possible avoir lieu quelques années après la fin de grands projets.

77. De plus, le suivi des projets de recherches et des projets visant à la mise en place d'institutions devrait retenir davantage l'attention. Le processus de développement des capacités de recherche étant très long, les instituts de recherche nouvellement créés ont besoin d'une aide consultative, bien qu'à un rythme croissant, pendant plusieurs années après l'achèvement des projets d'assistance. De façon plus générale, avec le développement progressif des capacités nationales, les besoins d'aide dans le domaine de la recherche halieutique évoluent. Plutôt que de projets autonomes à long terme, les pays qui possèdent déjà des capacités scientifiques et de l'expérience dans les domaines fondamentaux de l'halieutique ont davantage besoin de visites à court terme de consultants dans certains domaines spécialisés (par exemple, la conception de programmes de prospections sur les ressources ou de programmes statistiques, le traitement automatique des données, la programmation et la planification de la recherche, etc.).

78. De même, les instituts de recherche des pays en développement ont besoin de bourses afin de perfectionner régulièrement leur personnel de recherche. Il faut qu'ils organisent des groupes de travail et des séminaires et y assistent. Ils ont souvent beaucoup de mal à trouver, dans leurs propres budgets, les crédits nécessaires à ce type d'activités à court terme. Dans la plupart des cas, l'assistance aux projets de recherche ne prévoit rien qui permette de financer ces activités une fois les projets terminés, bien que celles-ci conditionnent souvent l'implantation des programmes et institutions de recherches qu'ils ont soutenus à l'origine. Récemment, les programmes d'assistance régionaux ont fait, cas par cas, un certain effort à cet égard. Mais leurs moyens sont généralement insuffisants pour répondre à la demande comme il conviendrait. En outre, plusieurs régions ne bénéficient pas de programmes de cette nature. Le Groupe de travail recommande donc de tenir pleinement compte de ces besoins à long terme quand on prépare des projets d'assistance et quand les administrations nationales et les organisations d'assistance en étudient le financement.

6.2 Projets de mise en place d'institutions

79. Ce type de projet est particulièrement important pour le développement à long terme de capacités scientifiques dans les pays en développement. Cependant, le nombre de projets ayant cette orientation spécifique parmi leurs objectifs principaux est relativement limité. Cela tient probablement au fait que la décision d'entreprendre des projets de cette nature implique des engagements généraux et à long terme que peu de pays en développement ont été en mesure de prendre jusqu'à présent. De même, d'après la documentation fournie au Groupe de travail pour sa seconde session, il apparaît que les pays en développement ont souvent de grave difficultés à faire fonctionner et à renforcer des unités de recherche initialement créées avec l'appui de programmes d'assistance.

80. Ces difficultés semblent avoir des causes multiples qui sont étroitement liées:

(i) il n'a pas suffisamment été prêté attention, lors de l'élaboration du projet, à la recherche de l'institution de contrepartie adéquate; il s'ensuit que les activités mises en place avec l'appui du projet ne sont pas prises en charge par l'institution appropriée;

(ii) incapacité de l'administration nationale à tirer pleinement parti des résultats obtenus par l'institut national de recherches;

(iii) le niveau général de développement économique du pays bénéficiaire ne lui permet pas de continuer à fournir l'appui nécessaire aux activités de recherche; d'où une perte de personnel qualifié, peu ou pas d'expansion des programmes de recherche dans l'institut de recherches;

(iv) soutien insuffisant accordé par le gouvernement au développement des activités de recherche en raison de la faible priorité accordée au secteur des pêches dans le développement économique national, ou à la recherche en matière de planification du développement des pêches nationales.

81. En fait, l'existence d'une administration nationale capable de soutenir la recherche et d'en tirer pleinement parti est une condition essentielle à la réussite des projets de mise en place des structures et, de façon plus générale, au développement des capacités scientifiques nationales. Le Groupe de travail met les changements politiques administratifs parmi les causes majeures de l'échec relatif des projets d'aide à la recherche. La continuité, qui a été soulignée à diverses occasions comme une condition du développement des capacités nationales, est particulièrement nécessaire à l'épanouissement d'instituts de recherches efficaces et autonomes.

82. Pour surmonter les difficultés énumérées plus haut, plusieurs démarches s'imposent. Il faut tenir dûment compte des structures institutionnelles existantes et, éventuellement, de la nécessité de les modifier ou de les compléter de façon que les activités lancées par le projet d'assistance s'insèrent dans cette structure et, ultérieurement soient reprises par l'institution nationale appropriée. L'administration nationale et l'organisme d'assistance doivent étudier et planifier des arrangements à long terme pour assurer une continuité satisfaisante dans l'apport d'un soutien et de directives techniques aux activités nationales de recherches. Dans le cas où les administrations nationales ne sont pas suffisamment conscientes des possibilités que représente la pêche pour le développement économique national, il faut dûment tenir compte, en planifiant l'aide aux programmes nationaux de recherche halieutique, de la nécessité d'améliorer l'évaluation des potentialités de ce secteur et de sensibiliser les administrations nationales concernées.

83. Parmi les différents systèmes qui ont été utilisés avec succès pour fournir des directives scientifiques aux instituts de recherches en développement, les accords de jumelage entre ceux-ci et des laboratoires de pointe suscitent manifestement un vif intérêt. Cette solution présente plusieurs avantages fondamentaux en matière d'assistance: durée et continuité, souplesse et adaptabilité pour l'échange de jeunes chercheurs et d'experts éprouvés

entre les institutions ainsi jumelées, responsabilité confiée aux responsables scientifiques des institutions en développement en ce qui concerne l'identification et l'exécution des grands projets de recherches, etc. En même temps, ces jumelages permettent à des institutions expérimentées d'étudier d'autres écosystèmes et d'élargir leur expérience. Ce type de coopération est particulièrement bien adapté à la mise en place d'institutions, car il peut fournir l'encadrement à long terme, évolutif et hautement spécialisé qui, on l'a montré, s'avère indispensable.

84. On a cité divers exemples d'applications de ce système, parmi lesquels la coopération particulièrement réussie entre la Thaïlande et la République fédérale d'Allemagne (annexe 12). Toutefois, la FAO a des difficultés à promouvoir et à utiliser ce type d'accord. Jusqu'à maintenant, les problèmes administratifs que pose l'organisation de cette coopération ont été plus faciles à résoudre dans le cadre de programmes d'aide bilatéraux. Le Groupe de travail est d'avis qu'il faudrait recourir davantage à ce type de coopération, notamment pour les projets visant à créer des structures de recherche. Il espère que la FAO pourra utiliser plus souvent cette méthode pour ses propres projets et poursuivra ses efforts en vue de promouvoir ce type d'association dans le cadre de la coopération bilatérale.

6.3 Projets multinationaux

85. Le Secrétariat a décrit les objectifs, fonctions et activités des programmes multinationaux mis en oeuvre par la FAO avec le soutien du PNUD et d'autres donateurs, ainsi que les plans prévus pour leur expansion. Les programmes régionaux d'assistance de la FAO, tels qu'ils existent actuellement, ne prévoient pas normalement de conduire les recherches elles-mêmes. Leurs principales fonctions sont les suivantes:

(a) appuyer les activités d'institutions nationales et régionales (par exemple les organes des pêches) concernant des problèmes d'intérêt régional (compilation et diffusion de statistiques, évaluation des stocks, gestion des stocks partagés, etc.);

(b) fournir un soutien et des bases techniques à la coopération entre pays membres sur des problèmes communs à plusieurs d'entre eux lorsque des avantages - économies d'échelle, meilleure utilisation d'experts peu nombreux - peuvent découler d'une approche concertée;

(c) favoriser, grâce à la réalisation d'études fondamentales, une meilleure compréhension des possibilités de développement et des besoins d'aménagement des pêches aux niveaux national et régional;

(d) fournir, à la demande des pays membres, une aide à court terme sous forme de services d'experts et de consultants dans des domaines hautement spécialisés.

86. Il est prévu de développer ces activités dans des domaines qui ne sont pas encore couverts par les programmes existants et de les compléter par des programmes interrégionaux, dont l'objet est de faciliter la diffusion des informations et des expériences entre les régions et de fournir un appui à des activités de portée mondiale (préparation de fiches d'identification des poissons, préparation de matériel didactique pour l'aménagement des pêches, etc.). La FAO exécute aussi un projet mondial, qui a pour objet d'effectuer, avec un navire de recherches fourni par la Norvège, des études acoustiques au large des côtes de divers pays riverains de l'océan Indien et de l'Atlantique, et de mettre au point des méthodes simplifiées d'évaluation des ressources.

87. Une proposition a aussi été présentée au Fonds intérimaire des Nations Unies pour la science et la technologie au service du développement. L'objet de ce fonds sera essentiellement de renforcer les capacités de recherche des pays en développement plutôt que de mener des recherches en tant que telles. La proposition de la FAO vise à promouvoir les capacités scientifiques et techniques dont les pays en développement ont besoin pour exploiter pleinement et rationnellement les ressources halieutiques qui existent dans leurs zones économiques respectives.

88. Le Groupe de travail note avec satisfaction que ces diverses activités multinationales ont sensiblement amélioré les programmes de recherches sur les ressources dans les diverses régions et accru la compétence des chercheurs nationaux et leur coopération. Il note en outre qu'une approche régionale est particulièrement importante dans les zones où il existe des ressources halieutiques partagées et où plusieurs pays ont la responsabilité conjointe d'aménager ces ressources.

89. Certains projets régionaux, par les contacts étroits et personnels qu'ils créent avec les chercheurs de la région, ont particulièrement favorisé la coopération entre laboratoires, en contribuant à coordonner et à normaliser les activités de recherche concernant les stocks exploités par plusieurs pays, et facilité les échanges de chercheurs entre pays en développement et une meilleure utilisation de ressources limitées, qu'il s'agisse de personnel ou d'installations. Lorsque plusieurs pays d'une région ont déjà instauré une coopération dans le domaine de la recherche, ces projets les ont aidés à l'intensifier.

90. On a considéré qu'il est important, pour le succès des séminaires et autres activités connexes multinationales, que les projets régionaux disposent de crédits suffisants pour aider les experts nationaux à participer pleinement à ce genre d'activités - participation particulièrement appropriée. D'une façon générale, il faudrait se préoccuper davantage de trouver les moyens d'encourager les contacts entre chercheurs de pays en développement. Leur participation à des réunions scientifiques aussi bien qu'opérationnelles devrait avoir une place plus grande dans la formation en cours d'emploi et contribuer à l'amélioration des compétences grâce à des contacts scientifiques stimulants. De même, les programmes régionaux devraient apporter une aide aux pays membres en organisant des cours de formation et des séminaires sur des sujets d'intérêt régional, en fournissant des bourses de perfectionnement si nécessaire, etc.

91. Les projets régionaux pourraient aussi contribuer à la publication des conclusions des groupes de travail et de manuels dans la langue de travail de la région.

92. Le Groupe de travail recommande de faire appel, chaque fois que possible, aux experts et institutions des régions. Diverses solutions permettraient d'utiliser davantage les experts locaux, ce qui aurait en outre pour effet de promouvoir le développement des compétences locales. En plus du recrutement d'experts et de consultants, les programmes régionaux devraient recourir, autant que possible, aux institutions des régions qu'ils desservent. Dans le cadre de contrats de recherche, elles seraient chargées d'étudier des problèmes de portée régionale. Le règlement de ces contrats pourrait se faire en crédits et équipements supplémentaires pour les équipes nationales, mais aussi sous forme de contributions techniques de la part d'experts étrangers chevronnés aux éléments critiques des programmes de recherches (par exemple la planification, l'interprétation des données, etc.).

93. On a fait observer également qu'il existe de nombreuses similitudes entre les fonctions du Programme ordinaire de la FAO et le mandat des programmes interrégionaux et mondiaux du PNUD. Etant donné l'expérience que la FAO a acquise depuis longtemps en matière d'échange d'informations, de méthodes et d'expériences entre les régions - en particulier entre pays développés et pays en développement - et en matière de promotion des recherches sur des sujets intéressant directement les pêches dans le tiers monde, le Groupe de travail insiste pour que les activités prévues et financées au cours de ces programmes bénéficient d'une coordination et d'une coopération totales.

94. Le Groupe de travail note en outre que le financement des projets régionaux rencontre des difficultés, qui affectent l'appui que ces projets apportent au renforcement des capacités de recherche des pays membres, ainsi que l'élargissement des activités et la mise en place de programmes analogues dans d'autres zones géographiques.

7. FORMATION ET ENSEIGNEMENT

7.1 Effectifs et compétences des diplômés et des techniciens

95. Dans certains pays où le personnel disponible est affecté en priorité à d'autres secteurs (administration, enseignement, etc.), la pénurie de diplômés ayant déjà une bonne formation en sciences fondamentales et de techniciens maîtrisant bien les techniques pertinentes a temporairement limité le développement des recherches sur les ressources halieutiques. Les conséquences de cette pénurie deviennent plus graves quand la formation générale en mathématiques et en statistiques est faible. Les autorités nationales et les organisations internationales comme l'Unesco doivent en tenir compte lorsqu'ils élaborent des programmes d'enseignement pour les écoles secondaires et les universités. Le Groupe de travail se félicite donc de l'initiative prise par la FAO et l'Unesco de mettre au point en commun un programme d'enseignement des sciences halieutiques qui permettra aux universités d'établir des programmes de formation dans ce domaine. Il espère que les recommandations de la FAO et de l'Unesco seront disponibles rapidement.

96. La formation de techniciens contribue aussi au développement du personnel de recherche. En réalité, la distinction entre chargés de recherches et techniciens n'est pas immuable et il faut la voir de façon dynamique et concevoir un mode d'enseignement qui permette aux techniciens qui en ont les capacités d'acquérir les qualifications universitaires et administratives requises pour devenir chercheurs.

7.2 Formation en cours d'emploi

97. La formation en cours d'emploi fait généralement partie intégrante des projets de la FAO concernant la recherche. Il est donc important que les experts internationaux qui participent à ces projets soient capables de transmettre leur savoir et que les experts nationaux soient choisis de façon à pouvoir en profiter et aient toute probabilité de poursuivre leurs activités dans le secteur concerné par le projet. Cependant, l'organisation de programmes de formation plus structurés au cours des projets de recherche sont souvent très utiles pour former d'autres spécialistes nationaux de la recherche qui ne sont pas nommément des homologues. Le Groupe de travail recommande que, quand la situation s'y prête, des conférences ou stages de formation soient inclus dans les descriptifs des projets concernant la recherche.

98. Il n'a pas toujours été tenu compte du fait que la formation est un processus qui doit se poursuivre tout au long de la vie professionnelle des chercheurs et des techniciens. Des cours et des séminaires doivent être organisés périodiquement dans chaque laboratoire de recherche pour former de jeunes chercheurs et techniciens, discuter des résultats obtenus par les chercheurs à l'occasion de leurs travaux et les amener à prendre conscience des besoins du pays en matière de recherche halieutique. Le Groupe de travail estime que la FAO pourrait participer davantage à ces activités en dehors de la durée des projets. Il recommande à la FAO de faire savoir aux organismes de recherches et aux universités des pays en développement qu'ils peuvent recevoir une aide sous forme de matériel didactique, conférences à l'occasion de stages et visites de consultants pour des entretiens non formels sur les thèmes, méthodes et programmes de la recherche fondamentale.

7.3 Manuels sur la recherche concernant les ressources

99. Le Groupe de travail reconnaît le rôle très important que jouent les manuels de la FAO sur les sciences halieutiques et de l'aide qu'ils apportent aux biologistes des pêches du monde entier pour ce qui est de l'acquisition des méthodes et des approches dont ils peuvent se servir pour leurs travaux sur les ressources halieutiques. Ces manuels sont aussi très utiles pour les cours de formation et, en fait, plusieurs d'entre eux ont d'abord été des documents établis dans ce but. Leur importance aux yeux des spécialistes des pays en développement ressort clairement des 60 réponses reçues à un questionnaire sur la disponibilité et l'utilité des manuels de la FAO et documents connexes (annexe 7), envoyé pour le compte du Groupe de travail au début de 1980. Environ 60 pour cent des personnes ayant répondu à ce questionnaire ont déclaré qu'elles possédaient leur propre exemplaire des principaux manuels de la FAO.

100. Mais, l'originalité des manuels de la FAO en tant que collection à part s'est perdue lorsqu'ils ont été intégrés dans la série "Document technique sur les pêches". Il existe à l'heure actuelle quelque 22 publications de cette collection qui portent explicitement le titre de "manuel" mais ils sont difficiles à repérer et ils ne sont pas complémentaires. Leur utilité serait bien plus grande si l'on conservait le concept original des manuels, en tant que collection destinée à couvrir les divers secteurs de travail qui intéressent les spécialistes des pêches et si ces ouvrages étaient régulièrement mis à jour pour tenir compte des nouvelles idées et méthodes à mesure qu'elles se généralisent. Il faut les concevoir en tant que manuels, en ayant bien en vue qu'ils seront utilisés par des chercheurs des pays en développement, dont beaucoup ne les liront pas dans leur langue maternelle.

101. Pour créer et assurer la continuité de cette collection de manuels, le Groupe de travail recommande que l'on constitue une équipe restreinte de rédacteurs techniques, composée de fonctionnaires du Siège et de spécialistes des pêches de pays en développement et de pays développés. Ce groupe travaillerait par correspondance et se réunirait de temps à autre selon que de besoin; il aurait pour mission d'établir le plan de la collection et de superviser la préparation, l'édition et la mise à jour périodique des manuels. Ceux-ci ne devraient pas être mis en vente mais être diffusés par l'intermédiaire de la FAO.

102. La distribution régulière des documents de la FAO, notamment des manuels et documents connexes, aux instituts de recherche est loin d'être complète. Le Groupe de travail recommande donc que les accords de distribution soient revus et, en particulier, que la Short Marine and Inland List[1/] soit mise à jour.

103. On a en outre fait observer qu'il y a de moins en moins de manuels et de documents connexes concernant la recherche sur les resources publiés dans plusieurs langues de la FAO. Il faut donc veiller à assurer la traduction des manuels et documents connexes de la FAO en d'autres langues.

104. Le Groupe de travail reconnaît que la préparation de ces manuels et leur traduction coûteront cher et poseront des problèmes particuliers. Afin de faciliter le travail, il recommande à la FAO de solliciter le concours financier d'organisations extérieures et d'obtenir la collaboration d'organismes nationaux de recherche pour la traduction des manuels dans autant de langues qu'il faudra pour assurer la diffusion correcte des connaissances qu'ils contiennent.

7.4 Cours de formation

105. Les cours de formation de la FAO en matière de recherches sur les ressources portent sur trois domaines scientifiques: i) théories et méthodes de la biologie des pêches; ii) statistiques et méthodes d'échantillonnage; et iii) évaluation des stocks, prospections acoustiques et autres sujets spécialisés. La plupart des cours ont eu lieu entre 1972 et 1979, dont cinq cours sur les théories et méthodes, huit en statistique et 14 sur des sujets spécialisés. Sur les cinq stages concernant les théories et les méthodes, il y en a eu un en Asie, un en Amérique latine et trois en Afrique.

106. Bien que, dans de nombreux pays, les nouveaux instituts halieutiques organisent de plus en plus leurs propres cours de formation, ces stages restent encore très nécessaires et il conviendrait d'en augmenter la fréquence. Comme les coûts de la formation augmentent et qu'il faut couvrir de nouveaux domaines, la FAO devrait s'efforcer de trouver de nouvelles sources de financement. En outre, comme il a été dit au paragraphe 7.2, il faut absolument que la FAO soit en mesure d'aider davantage les instituts nationaux de recherches et les universités des pays en développement à organiser et à conduire leurs cours en fournissant du matériel didactique, des conseils pédagogiques et un ou plusieurs enseignants. Les programmes régionaux, s'ils sont convenablement financés, sont particulièrement bien placés pour apporter un concours.

107. Le succès des cours de formation suppose la participation d'experts possédant une bonne connaissance des besoins des pays bénéficiaires, des caractéristiques des pêches dans la

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[1/] Liste abrégée des ressources marines et continentales (note de l'auteur) région concernée, des disponibilités en personnel, et des priorités de la formation. Le Groupe de travail recommande que les cours de formation s'appuient aussi souvent que possible sur des exemples locaux. Ces conditions ne sont pas toujours remplies.

108. Comme les cours de formation coûtent cher et mobilisent du personnel, il importe qu'ils soient parfaitement planifiés. Les conditions à remplir pour bénéficier d'un appui financier ainsi que les procédures administratives relatives à la préparation des stages sont généralement compliquées. On pourrait y remédier en faisant organiser les cours sur place par les projets régionaux.

109. Il est probable que les cours de formation spécialisés se feront de plus en plus nécessaires à mesure que les méthodes se perfectionnent. Toutefois, l'enseignement sur l'évaluation des ressources à un niveau élevé est en partie assuré par des groupes de travail qui s'intéressent principalement à l'analyse des données de la recherche mais qui accomplissent aussi un travail non négligeable de formation.

7.5 Centres de formation

110. La création de centres régionaux de formation a été maintes fois envisagée depuis de nombreuses années. Cependant, ces propositions n'ont pas été suivies de beaucoup d'effet. La réalisation la plus éclatante est sans doute le centre de formation aux méthodes de prospection acoustique de Lima (Pérou) qui fonctionne bien depuis cinq ans. D'autres tentatives ont moins bien réussi. Il faut la conjonction de nombreux facteurs favorables pour que ces centres restent viables et, en tout cas, il faut plusieurs années pour les mettre en place. Le Groupe de travail estime cependant que, quand les conditions s'y prêtent, ces centres peuvent réussir, en particulier s'ils sont associés à une université ou tout autre établissement de formation dans lesquels ils peuvent progressivement s'intégrer.

7.6 Bourses d'études et de perfectionnement

111. On ne dispose pas d'analyses du nombre de bourses d'études et de perfectionnement octroyées depuis quelques années, ni du nombre de pays qui envoient des étudiants ou d'instituts qui les accueillent. On n'a pas non plus de données sur les bourses d'études ou de perfectionnement de même nature octroyées en dehors de la FAO. On peut cependant s'appuyer sur les résultats d'une étude pilote menée par EXTRACO sur les bourses octroyées par la FAO dans le domaine de l'halieutique entre 1965 et 1971. Soixante-quinze pour cent des réponses faisaient état de problèmes resultant d'une connaissance insuffisante de la langue de travail, de l'inadaptation de la formation et d'une perte importante de stagiaires au profit d'autres emplois.

112. Pour ce qui est de l'identification des besoins, on n'a pas toujours fait une claire distinction entre une formation supérieure dans des universités étrangères (bourses d'études) et un séjour auprès d'instituts de recherches (bourses de perfectionnement). La seconde catégorie devrait être réservée aux chercheurs ayant déjà une formation de base dans leur discipline et possédant, de préférence, quelques années d'expérience pratique. Les chercheurs de passage devraient si possible être envoyés dans des instituts de la même région, ou dans des régions où les ressources halieutiques et les travaux de recherches présentent suffisamment de similitudes avec celles qu'ils ont des chances de rencontrer dans leur pays d'origine. La durée souhaitable de la plupart des stages correspondant à ces bourses de perfectionnement sera probablement de 3 à 6 mois. Il faut aussi accorder des bourses de perfectionnement dans des pays appartenant à d'autres régions, auprès de laboratoires conduisant des recherches de pointe sur des sujets touchant particulièrement aux travaux des stagiaires.

113. On a considéré qu'il est de la plus haute importance de trouver les conditions les plus favorables et les instituts les plus appropriés au travail des chercheurs. Les programmes régionaux devraient avoir une bonne partie des informations nécessaires pour faire ces choix.

7.7 Diffusion de la documentation scientifique

114. Le Groupe de travail prend note des progrès de l'ASFIS[1] et se félicite des dispositions prises pour en faire largement connaître les publications et services aux spécialistes des pêches des pays en développement. Cependant, dans plusieurs pays en développement, l'absence de bibliothèques et de services de prêts fait que les ASFA[2] n'y sont guère utilisables à l'heure actuelle. Il serait bon que l'ASFIS étudie le problème de la diffusion de l'information dans les pays en développement pour voir comment on pourrait répondre à leurs besoins particuliers.

115. De nombreux rapports intéressants sur les recherches effectuées par des laboratoires des pays en développement sont seulement ronéotypés et leur distribution est souvent limitée au service d'origine. La publication des documents scientifiques pose souvent des problèmes et les délais peuvent être longs. Les programmes régionaux publient bien les communications qui sont présentées à l'occasion de séminaires régionaux, mais il s'agit d'une solution partielle. Il faudrait qu'il existe des revues régionales des pêches, comme le Journal du Conseil du CIEM, qui publieraient des communications d'intérêt régional.

116. Il faudrait étudier la possibilité de transformer un certain nombre de bibliothèques existantes en bibliothèques régionales couvrant des sujets variés, qui offriraient des services spéciaux de prêt et de reproduction aux pays de la région; le Groupe de travail considère en effet le manque de services de bibliothèque comme un obstacle important au développement de la recherche scientifique dans les pays en développement.

1/ Système d'information sur les sciences aquatiques et la pêche

2/ Résumés sur les sciences aquatiques et la pêche

RESUMEN DE CONCLUSIONES Y RECOMENDACIONES

Necesidades de Investigación Pesquera a Nivel Nacional

El Grupo de Trabajo llegó a la conclusión de que, en los países en desarrollo considerados en conjunto, por regla general, eran insuficientes los medios y fondos disponibles para la investigación pesquera, tanto cuantitativa como cualtitativamente (párr. 35). Esta situación se ha hecho más crítica como consecuencia del cambio efectuado en el régimen oceánico, que ha aumentado las responsabilidades de todos los estados ribereños, y, en consecuencia, las necesidades de investigación, especialmente en los países en desarrollo.

La primera condición para garantizar el desarrollo satisfactorio de las posibilidades nacionales de investigación es la existencia de políticas pesqueras y de investigación globables y a largo plazo (párr. 62), lo que exige la clarificación de los objetivos y la determinación de las prioridades en los sectores pertinentes. Estas necesidades, junto con las características específicas de las pesquerías tropicales y el medio ambiente investigativo en los países en desarrollo, tienen a su vez, importantes consecuencias sobre la aplicabilidad de métodos y programas de investigación sobre recursos pesqueros en ellas (párrs. 17-23). Aunque el alcance y los detalles de los programas nacionales de investigación dependerán de factores tales como la importancia económica en la pesca nacional o el volumen de las economías nacionales, el desarrollo y eficaz institución de los sistemas estadísticos apropiados para evaluar y vigilar las pesquerías nacionales es una tarea prioritaria en cualquier país (párr. 19).

También se reconoció que el desarrollo de las posibilidades de investigación dependía de la existencia de una efectiva capacidad administrativa (párr. 81) y de una estructura institucional (párrs. 18-44) capaces de garantizar una ayuda y comunicación suficientes, en especial con respecto al aprovechamiento de la investigación. Para facilitar el flujo en ambos sentidos de la información entre la investigación y la administración, el Grupo de Trabajo opinó que la unidad de investigación preferentemente debería estar administrativamente emplazada dentro, o cerca de, la dirección de pesquerías nacionales (párr. 38).

Se admitió que la escasez de recursos financieros en los países en desarrollo es causa frecuente de que la asignación de recursos para la ciencia y la tecnología sea muy inferior al nivel necesario para lograr el volumen deseado (párrs. 8, 49 y 57). Para movilizar los expertos - en ámbito y número - necesarios para garantizar un desarrollo coherente y la utilización racional de los recursos pesqueros, son importantes el análisis de la fuerza laboral y la planificación a largo plazo (párr. 36). Para garantizar el suministro suficiente de la fuerza laboral idónea, los científicos y técnicos nacionales deberán disfrutar de condiciones de trabajo comparables a las ofrecidas en los departamentos de investigación y académicos alternativos (párr. 49). Con respecto a las embarcaciones de investigación, que son caras, no sólo de adquirir sino también de explotar y conservar, el Grupo de Trabajo recomendó que los países evalúen cuidadosamente su capacidad para afrontar estos gastos antes de tomar la decisión de comprar dichas embarcaciones, aún cuando estas se faciliten gratuitamente (párr. 74-75).

Cooperación Regional

El Grupo de Trabajo recordó que la cooperación regional es especialmente importante en la investigación sobre recursos pesqueros, por dos razones: en primer lugar, porque es el único método posible para evaluar y vigilar las poblaciones que están distribuidas y se mueven atravesando límites artificiales; en segundo lugar, porque puede dar una respuesta a las dificultades que encuentran los países para movilizar por separado las masas críticas de expertos, fondos y equipo (por ejemplo, embarcaciones de investigación, computadoras, etc.) (párr. 53). A este respecto, la función de los órganos pesqueros regionales, especialmente aquellos que ha instituido la FAO en la mayoría de las zonas tropicales, es particularmente importante, ya que proporcionan un mecanismo para que los estados miembros promuevan y organicen su cooperación regional (párrs. 44-46). Por ejemplo, el Grupo de Trabajo destacó que la participación en los grupos de trabajo, seminarios y otras actividades regionales era, por regla general, el medio más eficaz para que los científicos de menor categoría adquieran el pleno dominio de sus disciplinas y estén al día con los nuevos acontecimientos metodológicos (párr. 45).

Para sacar el mejor partido posible de las oportunidades que ofrece la cooperación técnica (TCDC), especialmente a nivel bilateral, los países en desarrollo necesitan más fondos, especialmente en divisas (párr. 46). Al determinar las actuales deficiencias existentes en la publicación y difusión de material científico en las regiones en desarrollo, los órganos pesqueros regionales y los programas, así como los organismos de ayuda, deberían considerar, con urgencia, la posibilidad de establecer y ayudar a los periódicos científicos regionales, centros de documentación y bibliotecas que prestan libros (párrs. 23, 54).

La Ayuda en los Proyectos de Investigación

Teniendo en cuenta las evaluaciones hechas sobre los logros alcanzados en el pasado por determinados proyectos de ayuda, el Grupo de Trabajo llegó a la conclusión de que la condición primordial para que estos proyectos tengan éxito es que estén concebidos como elementos integrales de una estrategia global para el desarrollo a largo plazo (párr. 62). Las administraciones nacionales deberán tener la principal responsabilidad en cuanto a formular y ejecutar estas estrategias.

Las calificaciones de los expertos extranjeros y nacionales relacionados con los proyectos locales -y en especial los directores de proyectos- constituían un factor principal para determinar el éxito de la ayuda en los proyectos de investigación (párr. 70-73, 95). Se tomó nota de las dificultades que frecuentemente afronta la FAO al contratar científicos locales con un buen nivel de experiencia. Se manifestó la esperanza de que la FAO, junto con las administraciones nacionales, podría elaborar procedimientos y condiciones que faciliten la cesión temporal de funcionarios (párr. 70).

Además se tomó nota de que gran parte de la ayuda en los proyectos de investigación tiene básicamente dos objetivos: (i) la realización de un determinado programa de investigaciones y (ii) el reforzamiento de las posibilidades nacionales de investigación. Se manifestó que para que dicha ayuda tenga repercusiones importantes, el tiempo es considerablemente mayor con respecto al segundo objetivo, especialmente cuando el proyecto tiene por finalidad crear instituciones nacionales de investigación. Esta diferencia en el requisito de tiempo no se ha tenido en cuenta frecuentemente al formular los proyectos, y esa práctica ha dado por resultado muy pocos fondos y compromisos de tiempo (párr. 63). Para lograr la madurez y autosuficiencia científica, las instituciones jóvenes necesitan frecuente ayuda (visita de expertos extranjeros especializados, becas para sus científicos principales en laboratorios avanzados, etc.) durante un período que, por regla general, es superior a la duración media de los proyectos actuales (párrs. 77, 78). El Grupo de Trabajo recomendó que la FAO y los organismos de ayuda, como el PNUD, presten la debida atención a esta necesidad.

El Grupo de Trabajo también estimó que el hermanamiento entre determinadas instituciones superiores y los laboratorios de investigación en los países en desarrollo, representaban un método muy efectivo de proporcionar ayuda técnica en materia de investigación pesquera y creación de instituciones. Manifestó la esperanza de que la FAO y otras organizaciones internacionales puedan superar las dificultades administrativas que todavía impiden que se recurra más frecuentemente a dicha forma de ayuda (párrs. 83, 84).

Se acogió con satisfacción el establecimiento, por parte de la FAO, de nuevos programas locales regionales. Esta clase de proyectos han demostrado su valor para facilitar ayuda técnica a las actividades de los órganos pesqueros regionales (párrs. 10, 89); para promover la TCDC notablemente mediante la aceleración de los contactos, investigaciones conjuntas (párr. 90), interpretación común de las conclusiones en materia de investigación (párr. 53) entre las instituciones de investigación de las regiones y expertos; y para facilitar las actividades de capacitación en sectores altamente especializados (párrs. 50, 96, 97). El Grupo de Trabajo manifestó su esperanza en que puedan movilizarse más recursos para ampliar la cobertura geográfica y el alcance de las actividades de estos proyectos (párrs. 90, 91).

Las especialidades científicas y las instituciones disponibles en cada región se deberán también utilizar lo más posible para aprovechar plenamente su experiencia de primera mano acerca de las condiciones de la región y darles oportunidades para el desarrollo (párr. 90, 92). Tomando nota de las muchas afinidades entre las actividades realizadas en virtud del programa ordinario de la FAO y aquellos financiados por los Programas PNUD interregionales y globales, y la enorme experiencia adquirida por la FAO en la mayoría de las materias abarcadas, deberá mantenerse una adecuada coordinación cuando se formulen y ejecuten estas actividades (párr. 84).

Capacitación

El Grupo de Trabajo examinó y evaluó cuidadosamente las actividades realizadas por la Dirección de Recursos Pesqueros en ese sector y admitió la importante función desempeñada por los manuales y cursos de capacitación de la FAO en materia de ciencia pesquera (párrs. 99-109). Recomendó que la serie de manuales de la FAO se mantenga actualizada, globalmente y por separado (párr. 100) y que se establezca una junta editorial a dicho fin (párr. 101). Además destacó que, al ejecutar su programa, la FAO debiera prestar suficiente atención a la capacitación de los enseñantes (párrs. 98, 106).

Difusión de Documentos Científicos

Por último, se estudió la cuestión de difundir los documentos científicos. Habrá que dedicar más esfuerzos a la traducción (párr. 103) y distribución (párr. 102) de los documentos de la FAO. Muchos países en desarrollo todavía no tienen los documentos y las bibliotecas que condicionan la plena utilización de los servicios facilitados por los programas ASFA1/ y ASFIS2/. Por lo tanto, al elaborar y ejecutar estos programas (párr. 114) hay que tomar en consideración las necesidades específicas y las condiciones existentes en los países en desarrollo.

1/ ASFA = Resúmenes sobre las Ciencias Acuáticas y la Pesca

2/ ASFIS= Sistema de Información sobre las Ciencias Acuáticas y la Pesca

1. INTRODUCCION

1. En su novena reunión, el CAIRM recomendó que la FAO instituyera un 'Grupo de Trabajo sobre la Promoción de las Investigaciones de Recursos Pesqueros en los Países en Desarrollo' con las siguientes funciones:

(i) Encargarse de que se hagan los análisis de una selección de proyectos de ayuda al desarrollo en materia de investigación de recursos, creación de instituciones de investigación y diversas formas de planes y actividades de capacitación a fin de evaluar la eficiencia y eficacia de diversos métodos y políticas;

(ii) estudiar las principales características de los sistemas de organizar y planificar la investigación sobre recursos pesqueros y, en especial, sobre la plena utilización de los escasos medios para la investigación;

(iii) estudiar los acuerdos institucionales para la cooperación internacional en materia de investigaciones, especialmente dentro del marco de las organizaciones regionales, por ejemplo, comisiones pesqueras;

(iv) elaborar conjuntos de estrategias y tácticas para la ayuda al desarrollo en investigaciones pesqueras que impliquen la transferencia de tecnología, capacitación y organización y que abarquen programas bilaterales entre países desarrollados y en desarrollo, los de organizaciones internacionales y cooperación entre países en desarrollo.

En el Anexo 1 figuran los miembros del Grupo de Trabajo.

2. Como consecuencia de una petición de la FAO, el Organismo Noruego de Desarrollo Internacional (NORAD) se ofreció para sufragar los gastos de la primera reunión, que se celebró en la Fundación Svanøy cerca de Florø, Noruega, del 2 al 8 de septiembre de 1979. En el Anexo 2 figura la lista de documentos preparados en aquella ocasión.

3. La primera reunión aprobó el siguiente programa.

(1) Examen de las funciones;

(2) los objetivos de la investigación sobre recursos pesqueros, con especial referencia a las regiones en desarrollo;

(3) las teorías, métodos y equipo, fundamento de las investigaciones sobre recursos pesqueros, con especial referencia a las condiciones de los países en desarrollo y transferencia de la tecnología;

(4) la organización, a nivel nacional, regional e internacional, de la investigación de los recursos pesqueros;

(5) algunas experiencias de los resultados de la ayuda para la investigación de recursos pesqueros:

  (a) proyectos de investigación

  (b) proyectos de creación de instituciones

  (c) capacitación y enseñanza

(6) necesidad de recursos para la investigación sobre recursos pesqueros (costos, equipo, mano de obra);

(7) planificación de las futuras actividades del Grupo de Trabajo.

En dicha ocasión se preparó un informe provisional.

4. En esta reunión se mencionaron varios factores asociados con los problemas de la investigación sobre recursos pesqueros en los países en desarrollo. Sin embargo, muchos de estos problemas no podrían tratarse apropiadamente o evaluarse sin un análisis en profundidad de lo siguiente:

(i) La situación de las actuales investigaciones sobre recursos en los países en desarrollo;

(ii) los pasados programas de capacitación de las Naciones Unidas y bilaterales;

(iii) la contribución de los proyectos de ayuda a las posibilidades de la investigación pesquera;

(iv) la actual capacidad de los países en desarrollo para instruir a graduados y posgraduados en materia de ciencias marinas (incluida la ciencia pesquera).

5. El Grupo de Trabajo también tomó nota de que sus esfuerzos se verían reforzados por una evaluación de la Conferencia de las Naciones Unidas sobre la Ciencia y la Tecnología (celebrada en Viena, Austria, 20-31 de agosto de 1979) así como por la función de los órganos pesqueros regionales de la FAO y programas de asistencia en ayuda y promoción de la investigación de recursos pesqueros en los países en desarrollo. Por lo tanto, la sesión decidió que se prepararan documentos con antecedentes sobre las siguientes materias para que constituyeran la base de los debates para la segunda reunión:

(i) Una evaluación de la situación actual de la investigación sobre recursos en los países en desarrollo;

(ii) un examen crítico de las Naciones Unidas/FAO y de determinados centros y cursos de capacitación pesquera bilaterales;

(iii) el impacto de determinados proyectos de ayuda pesquera de las Naciones Unidas y bilaterales sobre la competencia nacional en el sector de la investigación sobre recursos pesqueros en los países en desarrollo;

(iv) la disponibilidad de la capacitación para graduados y posgraduados en los países en desarrollo en el sector de las ciencias marinas - incluida la estadística;

(v) una evaluación de las recomendaciones de la Conferencia de las Naciones Unidas sobre la Ciencia y la Tecnología;

(vi) la función de los órganos regionales de la FAO y proyectos y programas locales regionales afines en ayuda y promoción de la investigación sobre recursos pesqueros en los países en desarrollo.

En el Anexo 3 figura la lista de documentos preparada para la segunda reunión.

6. La segunda reunión del Grupo de Trabajo se celebró en la FAO, Roma, del 8 al 12 de septiembre de 1980. En el Anexo 4 figura el programa aprobado para la segunda reunión.

7. Las discusiones de la reunión se centraron en actualizar la evaluación de la situación de la investigación sobre los recursos pesqueros en los países en desarrollo, impacto de los proyectos de ayuda (bilateral, multilateral y entre países) y el mejoramiento de los programas de ayuda con la información acopiada durante el período entre sesiones.

8. Lo que antecede se realizó en el contexto de alguna de las recomendaciones formuladas por la Conferencia de las Naciones Unidas sobre la Ciencia y la Tecnología (Viena, Austria, agosto de 1979, véase Anexo 10). De capital importancia entre todo ello fue que se admitiera el hecho de que la escasez de recursos financieros en los países en desarrollo es motivo de que con frecuencia sea muy inferior la asignación de recursos para la ciencia

y la tecnología al nivel crítico necesario para lograr los efectos deseados y de que hay urgente necesidad de establecer los mecanismos para aumentar las cantidades y mejorar las condiciones para la transferencia de los recursos financieros para la ciencia y la tecnología con destino a los países en desarrollo. Aún reconociendo la enorme importancia de la financiación, el Grupo de Trabajo tomó nota de que las políticas en materia de ciencia y tecnología de los países beneficiarios, son, en último lugar, factores determinantes. En consecuencia, deberán estimarse como una condición necesaria para la cooperación científica internacional y regional, lo que significa el establecimiento apropiado de prioridades y una planificación a largo plazo.

9. Sobre la cuestión de la institucionalización de la ciencia y la tecnología, la opinión general era que los países en desarrollo deberán garantizar la compatibilidad y coordinación de los diversos componentes del sistema científico y tecnológico (usuarios y productores de ciencia y tecnología). En consecuencia, se recomendó que en los órganos encargados de formular políticas para la ciencia y la tecnología, deberán tener estrechas relaciones de trabajo con las autoridades que gestionan y planifican el desarrollo social y económico, a fin de garantizar la integración de la ciencia y la tecnología en los programas de desarrollo y evitar que las actividades científicas y tecnológicas se vean aisladas de otros objetivos nacionales de desarrollo o estén en desacuerdo con los mismos.

10. A este respecto, la Conferencia recomendó que, la cooperación para las investigaciones sobre el desarrollo no debe concebirse en términos sectoriales, sino que deberá tener plenamente en cuenta las principales interacciones que un proceso de desarrollo bien concebido origina entre sectores afines dentro del ordenamiento nacional y regionalmente. El Grupo de Trabajo acogió con satisfacción estas recomendaciones y manifestó su esperanza en el sentido de que a ellas seguirían medidas prácticas en las futuras investigaciones cooperativas.

11. El informe provisional preparado en la primera reunión fue enmendado y complementado, para que reflejara plenamente las conclusiones y recomendaciones alcanzadas al final de la segunda sesión. Así el presente documento reemplaza al informe provisional.

12. Se hizo una selección de los escritos más interesantes preparados para las reuniones del Grupo de Trabajo. Los escritos seleccionados figuran en los Anexos 5-14.

2. LOS OBJETIVOS DE LAS INVESTIGACIONES SOBRE RECURSOS PESQUEROS, CON ESPECIAL REFERENCIA A LAS REGIONES EN DESARROLLO

13. Si se formularan de una manera general - por ejemplo, la adquisición de información cualitativa y cuantitativa sobre los recursos y su distribución geográfica y temporal - los objetivos de la investigación sobre los recursos pesqueros parecerían ser independientes de las características de los recursos, las condiciones para llevar a cabo las investigaciones y los objetivos de la comunidad. Sin embargo, las discusiones sobre esta cuestión pusieron de manifiesto bastantes dudas con respecto a la validez general de los más específicos objetivos de la investigación de los recursos pesqueros. Pueden depender de tres condiciones mencionadas anteriormente, a saber, las características del recurso, las condiciones y la función de la investigación y los objetivos de la comunidad. Especialmente en la fase de desarrollo, la función de un científico no se limita a la facilitación tecnocrática de información objetiva sino que también incluye la posibilidad de influir en la formulación de los objetivos comunitarios.

14. Así, pues, los objetivos investigativos de las regiones pesqueras altamente industrializadas podrían ser introducidos en zonas en donde podrían no ser apropiados. Por ejemplo, el objetivo ampliamente aplicado de 'determinar el rendimiento máximo sostenible' de un recurso, deberá utilizarse con gran precaución porque la experiencia ha demostrado que es muy inadecuado cuando se considera como un único objetivo de ordenación. Por ejemplo, el problema en un país en desarrollo podría ser cómo aprovechar plenamente aquellos recursos que ya están parcialmente explotados por las pesquerías artesanales. Un simple modelo de producción, puede dar importante información con respecto a las características de los

rendimientos potenciales de un recurso pero, por sí mismo, no proporcionará toda la gama informativa necesaria para tomar decisiones de ordenación inteligentes con respecto, por ejemplo, la utilización del recurso por varios posibles beneficiarios del mismo. Los objetivos de investigación deben evidentemente incluir una evaluación cuantitativa que podría tomar la forma de una estimación del rendimiento excedentario disponible para efectuar la cosecha de acuerdo con las condiciones reales del recurso, las características de la pesca y los objetivos de la utilización del recurso.

15. Los objetivos y prioridades de la investigación deberán ajustarse, en particular, a los objetivos comunitarios, tales como estudios sobre la disponibilidad, condiciones de captura y calidad de los recursos, a los cuales se les puede conceder gran prioridad en una fase inicial del desarrollo pesquero.

3. LAS TEORIAS, METODOS Y EQUIPO, FUNDAMENTO DE LAS INVESTIGACIONES SOBRE RECURSOS PESQUEROS, CON ESPECIAL REFERENCIA A LAS CONDICIONES DE LOS PAISES EN DESARROLLO Y TRANSFERENCIA DE LA TECNOLOGIA

16. En las regiones templadas se han desarrollado enormemente los métodos de investigación sobre los recursos pesqueros y también es donde se han aplicado más intensiva y generalizadamente. Por lo tanto, la cuestión de su aplicabilidad en las regiones tropicales y subtropicales, en donde se encuentran la mayoría de los países en desarrollo, es muy pertinente. La cuestión fue debatida por el Grupo de Trabajo con referencia a las distintas características de los recursos, las bases de su producción en aguas tropicales y las diversas condiciones para la investigación existente en la mayor parte de las situaciones iniciales del desarrollo económico, administrativo y tecnológico. Las principales características de los recursos, que difieren de las regiones templadas son:

- un gran índice de producción y una vida más corta de muchas especies;
- los recursos deben en muchos casos ser evaluados, explotados y ordenados como unidades compuestas de varias o un gran número de distintas especies;
- la reproducción que generalmente abarca una más amplia gama, en tiempo y espacio, que en las regiones templadas;
- características del crecimiento con ciclos estacionales de escasa amplitud.

17. Además, los datos sobre recursos obtenidos de las pesquerías pueden ser especialmente difíciles de lograr (por ejemplo, pesquerías en pequeña escala y artesanales con muchas unidades, primeras fases del desarrollo de la institución administrativa nacional) y, por consiguiente, pueden ser menos significativos que los datos acopiados en pesquerías más organizadas. Parte de los recursos en algunas regiones en desarrollo están sin explotar y, en consecuencia, no hay estadísticas pesqueras. También, la concentración de las actividades de investigación en unas pocas especies ha dejado en gran parte sin documentar una proporción importante de los recursos, especialmente las capturas accesorias y las especies descartadas. Todo ello va en detrimento de una evaluación y vigilancia adecuadas de los recursos pesqueros explotados y latentes. En general, hay falta de datos económicos y sociales (fuerza laboral).

18. Esta situación es especialmente insatisfactoria porque, incluso en aquellos países que tienen una limitada capacidad de investigación, puede acopiarse una información extremadamente valiosa a partir de las pesquerías existentes, lo que dista mucho de ser debidamente reconocido por parte de los gobiernos, y la insuficiencia - cobertura, detalle y confiabilidad - de las estadísticas nacionales continúa siendo una de las dificultades importantes que se oponen a un diagnóstico seguro de la situación de las poblaciones.

19. Por lo tanto, todo medio que un determinado país pueda dedicar a sus investigaciones pesqueras deberá introducir y establecer firmemente sistemas suficientes para el acopio y almacenamiento normalizado de las estadísticas pesqueras. Estas estadísticas deberán incluir datos de captura y esfuerzo de las principales pesquerías y, en la medida de lo necesario y posible, información sobre la composición y tamaño de las especies incluidas en las capturas. Mientras que el diseño del sistema de muestreo necesario y su periódico mejoramiento puede exigir aportaciones a corto plazo de especialistas externos, su operación rutinaria no requerirá mucho más que la contratación y financiación de enumeradores en cantidad y calificaciones suficientes. Ello garantizaría, para cada país, que existe una información básica, necesaria para examinar periódicamente la situación de las poblaciones y las pesquerías que sustenten, y facilitar a las administraciones nacionales y a la industria el suficiente asesoramiento para su ordenación.

20. Las consecuencias, en términos de método y aplicabilidad científica, de las características específicas de las pesquerías tropicales y de las condiciones operacionales para las investigaciones existentes en los países en desarrollo son considerables. El método de una sola especie, tan ampliamente aplicado en las pesquerías templadas, sólo puede utilizarse selectivamente. Debido a la corta vida y a los problemas de determinar la edad, los modelos analíticos tienen una aplicabilidad limitada sin que se efectúen especiales reajustes. Los modelos simplificados de producción global deberán también adaptarse y aplicarse. En poblaciones con unas importantes fluctuaciones de año en año en la producción, la observación de la biomasa mediante reconocimientos puede ser el sólo medio de garantizar una información útil a fines de ordenación. Por regla general, no se emplearán los estudios sobre huevos y larvas pero las encuestas de pesca y otras combinadas acústicas/pesca, serán frecuentemente indispensables para proporcionar estimaciones totales de la biomasa a partir de la cual pueden obtenerse rendimientos potenciales. También puede utilizarse con frecuencia toda la información disponible sobre las condiciones oceanográficas y la productividad primaria y secundaria para deducir índices comparativos de productividad de las poblaciones.

21. También se tomó nota de que es necesario formular métodos y técnicas apropiados para los estudios sobre recursos tropicales, por ejemplo, lectura de edad por zonas diurnas, sistemas de muestreo estadístico para las pesquerías artesanales, adaptación de técnicas de reconocimiento acústico en condiciones tropicales, desarrollo de índices de productividad por clases de comunidades ícticas y medios ambientes, etc. Debido a la escasez de recursos para las investigaciones y a las difíciles condiciones del trabajo, la tecnología y su equipo deberá ser lo más simple posible. Los reconocimientos pesqueros relativamente sencillos, si están bien proyectados y ejecutados, pueden proporcionar mucha información esencial.

22. Debido a las series disponibles sobre las características de los recursos pesqueros en aguas tropicales, existe también poca información sobre problemas centrales de interés general para la ordenación de estos recursos; por ejemplo, las fluctuaciones de la población a largo plazo y las relaciones población-reclutamiento, la capacidad de recuperación de las poblaciones bajo presión pesquera, las interacciones entre poblaciones, etc. Todo ello hace que las decisiones de ordenación sean más difíciles para estos recursos y que sea aconsejable tener mucha precaución. A medida que la ciencia avanza y se difunde, la atención sistemática a estos problemas de investigación mejoran pronto nuestros conocimientos. Para garantizar las mejores oportunidades para este proceso, hay que tener en cuenta la organización de estudios especiales sobre cuestiones y estudios de los recursos ícticos tropicales y subtropicales.

23. El Grupo de Trabajo también tomó nota de que además del hecho de que las investigaciones de los recursos pesqueros en muchos países en desarrollo se han desenvuelto deficientemente, los resultados de las investigaciones efectuadas se conocen y difunden poco. Ello se debe principalmente a la poca oportunidad de publicar las conclusiones de las investigaciones en dichas zonas. El Departamento de Pesca de la FAO deberá estudiar la posibilidad de editar boletines científicos regionales para promover la difusión de los resultados investigativos en esta zona.

4. ACTUAL SITUACION DE LAS INVESTIGACIONES SOBRE RECURSOS PESQUEROS EN LOS PAISES EN DESARROLLO

4.1 Estudio en Determinados Países

24. En su primera reunión, el Grupo de Trabajo decidió que se emprendiera un estudio para proporcionar información sobre los científicos de pesca existentes en los países en desarrollo, el nivel de su enseñanza y capacitación oficial, el alcance de sus posibilidades (disciplinas científicas disponibles), disponibilidad de fondos y medios (incluidas las embarcaciones de investigación), el marco institucional dentro del gobierno u organización, sus relaciones con los usuarios de conclusiones investigativas y el compromiso total financiero para las investigaciones pesqueras (evaluación de recursos) frente al valor en muelle de los recursos pesqueros cosechados. Se admitió que un estudio global de esta naturaleza no podía prepararse, por el momento, para todos los países en desarrollo, y, en consecuencia, tendría que hacerse de acuerdo con las necesidades de determinados países pesqueros de Africa, América Latina y Asia.

25. Con un cuestionario, la Secretaría de la FAO emprendió el estudio. La cobertura del mismo estaba desgraciadamente lejos de ser global pero algunas de sus conclusiones proporcionaron una información útil e interesante.

Se recibieron respuestas de los siguientes países:

Africa: Argelia, Costa de Marfil, Ghana, Mozambique, Mauritania, Marruecos, Senegal, Sierra Leona, Tanzania, Seychelles

Asia: India, Malasia, Filipinas, República Democrática Popular del Yemen

América Latina: Uruguay, Argentina, Colombia, Cuba, Ecuador, Jamaica

Oceanía: Nueva Guinea

Mediterráneo: Chipre[1]

es decir, un total de 22 países en desarrollo.

Acuerdos Institucionales

26. Por regla general, se describieron con algún detalle pero a los fines de este análisis se examinaron dos modelos básicos, a saber, interno, en donde la unidad de investigación forma parte de la administración pesquera, y externo, en donde la investigación es responsabilidad de otras instituciones, por ejemplo, la universidad, Consejo de Investigaciones, etc.

27. La distribución de las respuestas fue como sigue:

	Interno	Externo
Africa	7	3
Asia	2	1
América Latina	6	0

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[1] Además de Argelia y Marruecos, mencionados en Africa

Oportunidades de capacitación a nivel universitario en las instituciones nacionales

28. El número de instituciones nacionales que dan capacitación básica a nivel universitario para los científicos pesqueros son:

en los países africanos que contestaron, 10
en los países asiáticos que contestaron, 11
en los países latinoamericanos que contestaron, 13

El emplazamiento - en el país o en el extranjero - en donde los profesionales contratados para las instituciones de investigación pesquera recibieron su capacitación universitaria oficial era (el número de científicos) como sigue:

	Nacional	Extranjero	Proporción nacional/extranjero
Africa	27	57	0.5
Asia	221	10	22
América Latina	217	22	10

Fuerza laboral

29. El número de científicos según especialización y el de técnicos era como sigue (media por región):

	Biólogos de recursos	Expertos en medio ambiente y contaminación	Otros	Total	Técnicos
Africa	6.5(58%)	3.4(30%)	1.5(12%)	11.2(100%)	10
Asia	83(62%)	28(21%)	22(17%)	134(100%)	117
América Latina	30(60%)	10(20%)	10(20%)	50(100%)	32

Gastos de investigación

30. Los gastos totales de investigación, expresados como porcentaje del valor de las capturas de primera mano, fueron:

	Porcentaje	Media (%)
Africa	0.3-2.5	1.0
Asia	0.1-3.0	1.0
América Latina	0.5-3.0	2.0

Comentarios

31. Antes de hacer comentarios sobre estas estadísticas se tomó nota de que las mencionadas cifras no eran comparables directamente. Estaban influidas por un gran número de factores. Por ejemplo, con independencia del volumen de las pesquerías nacionales o el nivel de desarrollo general económico del país, grandes países como la India se esperaba que fueran capaces de cubrir una más amplia gama de disciplinas. A este respecto, el resumen estadístico notificado para Asia refleja, en gran parte, la situación de los grandes países y no con tanta precisión como en los pequeños del mismo continente. Por lo tanto, no pueden ser comparados directamente con las cifras correspondientes a Africa en donde los países que dieron los datos eran en general más pequeños, tanto geografica como económicamente.

32. A pesar de sus limitaciones, los datos del estudio indican que en más de las dos terceras partes de los países incluidos, la investigación sobre los recursos pesqueros depende principalmente de una institución especial que forma parte de la administración pesquera nacional. Sólo en algunos de los países notificantes de las regiones africanas y asiática, la unidad de investigación forma parte de un consejo de investigaciones más general u otro órgano similar.

33. En todas las regiones, existe en los países incluidos en el estudio, un número considerable de instituciones académicas que dan cursos de capacitación en materias de importancia para la ciencia pesquera. Igualmente, los historiales sobre el origen de la capacitación profesional del personal contratado por las instituciones de investigación indica que se ha hecho uso de las posibilidades de capacitación disponibles. Sin embargo, existe una considerable diferencia entre las regiones ya que algunos países de Africa sólo tienen una tercera parte de sus profesionales que reciben capacitación básica en instituciones nacionales mientras que en Asia y América Latina la proporción es de un 90 por ciento o más.

34. Con respecto al número de científicos que se ocupan de la investigación sobre recursos pesqueros, existe también una clara diferencia entre las regiones. Teniendo en cuenta los países, los números quizás no digan mucho, ya que hay países de tamaños muy distintos incluidos pero hay una indicación de la escasez de científicos en los países africanos en comparación con los de Asia y América Latina. La proporción entre las diversas categorías enumeradas indica una razonable prioridad entre las disciplinas.

35. Los gastos de investigación, como parte del valor estimado de primera mano de los desembarques, indica una amplia gama entre países de un 0.1 a un 3.0 por ciento. Una estimación similar del nordeste del Atlántico, basada en un estudio de 1974[1], indica una oscilación de 0.5 a 3.7, con una media del 2 por ciento para nueve países de Europa occidental, lo cual puede compararse con una media del 1 por ciento para los países de Africa y Asia y un 2 por ciento para los países de América Latina. Sin embargo, la mayor parte de los países en desarrollo tendrían relativamente más potencial para el desarrollo de sus pesquerías y, en consecuencia, el valor de sus recursos pesqueros está probablemente subestimado por el valor de primera mano de sus actuales capturas. Si se supone que los países del nordeste del Atlántico tienen un nivel suficiente de gastos sobre investigación de recursos, uno puede entonces llegar a la conclusión de que, en general, los gastos por parte de los países en desarrollo incluidos en el estudio son insuficientes.

36. El Grupo de Trabajo llegó a la conclusión de que el estudio había proporcionado alguna información sobre la materia. Sin embargo, hay que efectuar ciertas actividades para obtener datos más globales y representativos, ya que estas evaluaciones pueden dar importantes orientaciones para tomar decisiones sobre políticas y prioridades.

4.2 Organización a Nivel Nacional

37. El Grupo de Trabajo examinó detalladamente el emplazamiento institucional de la investigación de los recursos en relación con la organización gubernamental encargada de formular y ejecutar las políticas sobre desarrollo y ordenación pesquera. Como se indica en el estudio mencionado, en la mayoría de los países la investigación pesquera se realiza en una sección, departamento o instituto, que forma parte integral del departamento que formula y ejecuta la política pesquera, siendo el director de investigaciones directamente responsable ante el jefe administrativo del Departamento de Pesca. En algunos países las investigaciones se llevan a cabo en un laboratorio o instituto que forma parte de una organización de investigaciones mayor y que abarca, por regla general, la totalidad del sector agrícola. En otros, la investigación sobre los recursos pesqueros forma parte de una organización de investigaciones nacional (o posiblemente ministerio) cuya competencia abarca muchos sectores de la economía. En algunos países los departamentos universitarios participan en las investigaciones sobre recursos pesqueros.

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[1] Saetersdal, G., 1975 Nota sobre el estado de las investigaciones pesqueras en el nordeste del Atlántico. _En_ el Supl. 1 del informe de la octava reunión del CAIRM, Sesimbra, Portugal, 8-12 de septiembre de 1975. _FAO, Inf.Pesca,_ (171) Supl. 77-85

38. Se estimó que la información en dos sentidos entre los científicos de pesca y los administradores pesqueros se facilita enormemente con la más estrecha relación institucional posible entre las investigaciones sobre recursos pesqueros y la administración de pesca y, en consecuencia, el emplazamiento de la investigación de los recursos se ve favorecida dentro del Departamento de Pesca estatal. Este arreglo también facilita el desarrollo y firme establecimiento de sistemas estadísticos eficientes. Como los científicos de pesca son los principales usuarios de las estadísticas pesqueras, pueden contribuir en la proyección de planes de muestreos y ayudar en la capacitación de los enumeradores locales. Por último, estos arreglos facilitan el empleo por parte de los científicos pesqueros de la red provincial del Departamento de Pesca para mantener contacto con el sector pesquero y estar personalmente informados al máximo con respecto a los cambios de las prácticas pesqueras que podrían afectar, por ejemplo, la eficiencia de las operaciones de pesca y, en consecuencia, la estimación del esfuerzo pesquero.

39. Hubo razones históricas para el emplazamiento particular de la investigación pesquera en cada país pero, en conjunto, que el país sea grande o pequeño e independiente de la importancia de los recursos pesqueros, los estrechos lazos entre la investigación de los recursos y la administración de pesca contribuye a garantizar que la política futura esté orientada por una información y asesoramiento idóneos. Esto será muy importante a medida que los recursos están más explotados y las pesquerías estén bajo una ordenación activa. Sea cual fuera la solución que se adopte para el establecimiento institucional oficial, se establecerán las debidas conexiones para garantizar una comunicación suficiente con la administración pesquera o de investigaciones fuera de institución oficial, lo cual podría hacerse, por ejemplo, estableciendo comités asesores permanentes.

40. En todo caso, el Grupo de Trabajo subrayó que, por muy estrechas que fueran estas relaciones, es esencial que el instituto de investigaciones mantenga su autonomía en cuestiones científicas y con relación a sus operaciones internas. Indudablemente, una autonomía suficiente para desarrollar sus programas de investigación a largo plazo, condiciona la capacidad de las instituciones de investigación pesquera en cuanto a dar a los administradores, empresarios y pescadores el asesoramiento científico sobre el cual puedan elaborarse planes coherentes de desarrollo y ordenación a largo plazo.

41. Aunque este emplazamiento de la unidad de investigación dentro de la administración pesquera se considera, por regla general, ventajoso, en algunos casos puede tener repercusiones marginales desfavorables. Por ejemplo, esta estructura organizativa puede ser causa de otra en la cual los profesionales de la unidad de investigación están en peores condiciones que en otras instituciones de investigación del país, por ejemplo, en las universidades. Todo esto afectó negativamente en algunos casos la contratación y la continuidad en el trabajo de los buenos científicos. Las condiciones laborales en los laboratorios estatales para el personal científico necesitan ser de tal naturaleza que puedan competir en igualdad de condiciones con las universidades y otras instituciones nacionales.

42. Deberá mantenerse una cooperación activa entre los laboratorios de investigación pesquera y los departamentos universitarios implicados en todos los sectores afines de investigación. Con ello se contribuiría a garantizar que la enseñanza de materias pesqueras en la universidad sea apropiada y afín a las necesidades pesqueras nacionales y la situación actual de la ciencia. Los científicos en pesca pueden dar conferencias y enseñar a graduados o subgraduados. También, los contactos estrechos entre estos puede contribuir a que la universidad realice investigaciones, lo cual es también útil para el conocimiento de los recursos pesqueros del país.

43. Además de establecer estrechos lazos con las instituciones que laboran dentro de las mismas disciplinas, deberá también mantenerse contacto con unidades de otras disciplinas pertinentes, por ejemplo, tecnología pesquera y tecnología de la elaboración del pescado, nutrición humana, ciencias sociales, economía. La estructura y preparativos organizativos deberán ser de tal naturaleza que faciliten estos diversos contactos.

4.3 Acuerdos Regionales y Cooperación Técnica entre Países en Desarrollo

44. Los órganos pesqueros regionales han facilitado a sus estados miembros un mecanismo esencial para resolver las cuestiones suscitadas por la explotación de poblaciones internacionales y compartidas, especialmente la promoción y coordinación de estudios para la evaluación de recursos y la formulación y negociación de planes de ordenación . A este respecto, el Grupo de Trabajo tomó nota de que los órganos pesqueros instituidos por la FAO en la mayoría de las zonas tropicales y subtropicales, estaban desempeñando una función cada vez más importante a medida que aumentan las posibilidades científicas de sus estados miembros (Anexo 6). Acogió con satisfacción la institución por parte de la FAO de programas locales regionales con ayuda del PNUD y otros donantes multilaterales y bilaterales para desempeñar funciones como una unidad de ayuda técnica de estos órganos pesqueros regionales. Aunque la función de los órganos pesqueros regionales se ve afectada por los cambios que tienen lugar en el régimen oceánico, continuará siendo esencial en aquellas regiones en donde el número de poblaciones compartidas es alto; por ejemplo, para el acopio y el intercambio de estadísticas de pesca, la organización de grupos de trabajo conjuntos para evaluar las poblaciones y el análisis y formulación de posibles planes de ordenación.

45. Estos órganos regionales continuarán siendo extremadamente útiles en todas las regiones en cuanto a facilitar y promover la cooperación regional, especialmente entre los países en desarrollo. La participación de los científicos de menor categoría en los grupos de trabajo regionales parece ser uno de los medios más eficientes de llevar a cabo su capacitación. Al facilitar el intercambio de puntos de vista y experiencias, el examen crítico de las investigaciones por parte de la comunidad científica, la selección de prioridades de investigación y la repartición de programas de investigación, en opinión del grupo, la colaboración regional parece ser el método más eficiente para garantizar un continuo mejoramiento de la experiencia nacional. Se estimó que todo ello debería continuar y reforzarse.

46. El Grupo de Trabajo también puso de relieve el valor de la cooperación científica y técnica entre los países en desarrollo para promover el empleo e incrementar su propia experiencia e instituciones. Aunque las pesquerías regionales y los órganos económicos pueden ser un instrumento eficiente para promover estas actividades, los países en desarrollo también tienen varias oportunidades para fomentar su colaboración directamente. En este contexto, se citaron varios ejemplos de cooperación bilateral en el sector de las investigaciones pesqueras; por ejemplo, Cuba/Guyana, Cuba/México, Indonesia/Tailandia, Indonesia/Malasia, Costa de Marfil/Ghana, etc. Sin embargo, la plena utilización de las oportunidades TCDC se ve frecuentemente dificultada por la falta de fondos, especialmente en divisas. Se estimó importante que los propios países en desarrollo comprometan fondos suficientes, incluido aquéllos procedentes de presupuestos multilaterales y bilaterales administrados nacionalmente.

5. RECURSOS NECESARIOS PARA LA INVESTIGACION PESQUERA

5.1 Fuerza Laboral

47. El Grupo de Trabajo se ocupó de la cuestión relativa a la fuerza laboral naecesaria para ejecutar los programas de investigación sobre recursos pesqueros y estimó que había un número mínimo de 'masas críticas' sin las cuales no serían posible las investigaciones sobre recursos y el asesoramiento idóneo sobre medidas de desarrollo y ordenación. Con la diversidad de especies existentes en los ecosistemas tropicales y la variedad de cuestiones por contestar, se estimó que el número mínimo para emprender independientemente unos programas de investigación pesquera relativamente globales era alrededor de 7 a 10 científicos y, entre éstos, su calidad como investigadores era más importante que su cantidad.

48. En muchos de los países más pequeños, así como aquéllos con un número relativamente limitado de recursos pesqueros, el número de científicos probablemente sea menor y, en este caso, la participación en grupos de trabajo organizados regionalmente, talleres y otras actividades es especialmente importante para contribuir a aumentar su conocimiento, competencia y eficacia.

49. En algunos países, la contratación y selección de científicos de calidad evidente está originando un problema real. Se debe a la disparidad existente en la estructura de sueldos y condiciones de trabajo en los departamentos de pesca frente a las de las universidades y algunas veces incluso en otros departamentos estatales, tales como agricultura y zootecnia, así como en el sector privado. A fin de garantizar un suministro suficiente de fuerza laboral idóneo, el Grupo de Trabajo recomendó que la paridad - que abarca condiciones de servicios tales como cierta libertad para llevar a cabo las investigaciones (dentro de una zona de responsabilidad) así como el sueldo - debe garantizarse a este respecto.

50. En el desarrollo de programas de fuerza laboral, es necesario incluir no sólo a los científicos sino también al personal necesario para las actividades de las embarcaciones de investigación y los medios en tierra para la conservación de las embarcaciones, así como el empleo de un equipo complicado como es el caso de los aparatos acústicos y computadoras. Se puso de relieve la necesidad de contar con la ayuda de la FAO en estos programas. Como un método regional es frecuentemente necesario para organizar las actividades de capacitación en sectores altamente especializados (estadísticas de pesca, evaluación de poblaciones, estudios, ordenación pesquera, acuicultura, etc.), el Grupo de Trabajo estimó que los proyectos regionales de la FAO tienen una responsabilidad primordial en la selección y preparación de estos cursos, así como en la reunión de fondos para financiarlas.

5.2 Equipo

51. Si bien algunas investigaciones marinas requieren el empleo de un equipo muy complicado, el Grupo de Trabajo tomó nota de que podría efectuarse una labor extremadamente útil para la evaluación de los recursos con muy poco equipo, utilizando estadísticas de las pesquerías comerciales y haciendo observaciones sobre la talla y otros datos, sin embarcaciones de investigación, en los mercados y en las embarcaciones pesqueras comerciales. Para este trabajo sólo hay que tener unas tablas de medición, un microscopio y máquinas de calcular. Sin embargo, cuando los recursos son extensivos y cuando el acopio de datos pesqueros globales tiene que afrontar serias dificultades que no pueden superarse rápidamente, es esencial el empleo de embarcaciones de investigación.

52. Incluso las computadoras, que cada vez son más necesarias para tramitar grandes cantidades de datos sin elaborar, se pueden encontrar a precios razonables y el perfeccionamiento de las computadoras de mesa hace ahora posible que muchos institutos pesqueros en los países en desarrollo adquieran su propio equipo. Esto se estimó importante por parte del Grupo de Trabajo, para reducir los retrasos en la elaboración de datos y familiarizar a los científicos pesqueros con el empleo de dicho equipo.

53. Cuando la evaluación de los recursos pelágicos requiera el empleo de equipo acústico complicado que el país no puede comprar o mantener habrá que buscar programas cooperativos con los países que tienen dicho equipo y la experiencia necesaria para su utilización, para satisfacer esta necesidad.

54. Por último se observó que en varios países en desarrollo, las bibliotecas para los estudios de investigación sobre recursos pesqueros se encuentran en un deplorable estado o incluso no existen. Esto hace que sea muy difícil que prosperen las investigaciones pesqueras. Cada centro de investigación pesquera debe contar con libros fundamentales, manuales y publicaciones sobre investigación pesquera. Además, libros científicos actualizados sobre sistemática, incluyendo claves para la identificación de especies ícticas y todos los aspectos de los estudios relativos a la biología de recursos, en especial los que se refieren a la zona o región en la cual está interesado el país, así como sobre los métodos básicos para evaluar los recursos que es esencial para una pronta referencia.

5.3 Costos y Financiación

55. El Grupo de Trabajo admitió el hecho de que los costos de la investigación de los recursos pesqueros son muy variables. Como las embarcaciones de investigación son caras y sus gastos de explotación también son muy altos es muy difícil que los países más pequeños puedan utilizarlas plenamente aun cuando sean donadas en virtud de programas de asistencia. Cuando

un país donante proporciona equipo muy caro, como es el caso de una embarcación de investigaciones, debería también contribuir con más fondos para su mantenimiento durante un número suficiente de años. El Grupo de Trabajo también recomendó que se examine la posibilidad de crear servicios para las embarcaciones de investigación regionalmente.

56. Se examinó la información sobre financiación que figura en los documentos de antecedentes y en los artículos enviados. Se admitió que la insuficiencia de fondos constituía la principal dificultad de las investigaciones sobre recursos en la mayoría de los países en desarrollo. Se dieron ejemplos de países o regiones donde se realizaba un progreso positivo, que se ha logrado parcialmente como consecuencia de la ayuda exterior (proyectos de ayuda nacional o regional) y que ha empeorado una vez que ha cesado la financiación extranjera.

57. Los países en desarrollo tienen urgente necesidad de aumentar la cantidad y calidad de las investigaciones sobre recursos. Para lograr esto, los gobiernos deben reconocer que sería necesario incrementar notablemente la financiación. Sería útil que la industria pesquera contribuya a la investigación sobre recursos, pero el Grupo de Trabajo destacó que era esencial que el resultado de las investigaciones se divulge en general.

6. PROYECTOS DE AYUDA PARA INVESTIGACION DE LOS RECURSOS PESQUEROS

58. El Grupo de Trabajo examinó los logros, obstáculos e inconvenientes de las investigaciones y proyectos de capacitación, teniendo en cuenta los análisis realizados durante el período entre sesiones. Los rendimientos de los proyectos de ayuda, tanto bilaterales como multilaterales en 11 países (Anexos 5, 8, 11, 12 y 13) han sido analizados por personas que han estado en estrecha relación con los países beneficiarios, así como con las organizaciones de ayuda. Al examinar esta cuestión, el Grupo estimó que debería discutir por separado los proyectos nacionales y entre países, pero que no era necesario evaluar los proyectos financiados bilateralmente aparte de aquellos financiados con fuentes multilaterales ya que sus necesidades y dificultades eran similares.

6.1 Proyectos Nacionales

6.1.1 Formulación y planificación de proyectos

59. Teniendo en cuenta su filosofía básica, la mayoría de los proyectos de investigación se han proyectado para que incluyan dos importantes componentes: (i) la ejecución de un determinado programa de investigaciones, y (ii) la capacitación del personal nacional de investigaciones. El relativo énfasis dado a estos dos aspectos varía de un proyecto a otro pero, en general, se ha prestado una más inmediata atención al apartado (i).

60. Hablando en términos generales, hubo acuerdo entre las diversas evaluaciones contenidas en los escritos presentados en el Grupo de Trabajo sobre el rendimiento logrado por los proyectos de ayuda. Dentro de los límites de sus objetivos inmediatos y del alcance de su competencia, generalmente han tenido éxito para identificar prioridades - para la mayoría de ellos el inventario de los recursos y su evaluación cuantitativa - así como las medidas apropiadas (formulando y aplicando métodos - incluidos los reconocimientos - para la evaluación de los recursos) necesarias para lograrlas. En consecuencia, la mayoría de ellos han contribuido eficazmente a la adquisición de información cualitativa y cuantitativa sobre los recursos y, mediante la capacitación mientras dura el servicio y la concesión de becas, a la capacitación de gran número de científicos de pesca en los países en desarrollo.

61. Sin embargo, su impacto sobre el desarrollo y, incluso más, sobre la ordenación de las pesquerías nacionales, por regla general, ha dejado con mucho de ser satisfactorio. Además, con frecuencia su contribución para reforzar las instituciones y estructuras nacionales no ha tenido los efectos duraderos que se habían esperado.

62. Las causas de estas deficiencias son muchas y difíciles de separar objetivamente. Como el desarrollo es un proceso extremadamente complejo (Anexo 8), generalmente no es posible relacionar directamente las causas y los efectos y, en particular, los logros del desarrollo sólo a los insumos de los proyectos locales. En varios países, las administraciones nacionales no tuvieron plena conciencia de las oportunidades ofrecidas por las pesquerías nacionales ni de las necesidades - especialmente con respecto a los insumos de investigación - para su desarrollo racional y ordenación apropiada. En consecuencia, no se ha prestado suficiente atención a la formulación de políticas globales de investigación y pesca a largo plazo y a la necesidad de los proyectos sectoriales de integrarse armoniosamente en los planes generales. Indudablemente, se identificó la falta de continuidad como una de las principales deficiencias en la mayoría de los proyectos. Esta falta de continuidad fue causa de escasos compromisos de fondos por parte de los organismos de ayuda y de cambios imprevistos de actitud de los gobiernos con respecto a los objetivos del proyecto.

63. Las deficiencias fueron particularmente dañosas con respecto al reforzamiento de las capacidades nacionales científicas y la creación de instituciones. Mientras que determinados programas de investigación pueden ejecutarse con éxito durante el tiempo medio que duran la mayoría de los proyectos de campo - generalmente, algunos años - el desarrollo de las capacidades nacionales de investigación e instituciones es un proceso que imperativamente necesita prorrogarse durante un período de tiempo considerablemente mayor que la normal duración de los proyectos del PNUD y la mayoría de los bilaterales.

64. En el Anexo 8, el autor destaca la superioridad de los proyectos 'orientados a programas' con respecto a los 'orientados a los objetivos', es decir, de proyectos encaminados a ayudar a los países para que establezcan determinadas capacidades e infraestructuras en vez de la ejecución de específicos conjuntos de investigaciones. Esta distinción puede no ser tan crítica como se ha sugerido si la información necesaria para formular y ordenar racionalmente los recursos pesqueros nacionales, los medios requeridos para dicho desarrollo y la manera de movilizarlos - incluida la función asignada a la ayuda exterior - se identifican y planifican apropiadamente.

65. El comentario hecho en el mismo documento en el sentido de que, en algunos países, las prácticas de la ciencia pesquera no fueron mucho más allá de la aplicación inmediata de los modelos cuantitativos para la evaluación de poblaciones, sin prestar suficiente atención a los más amplios aspectos del comportamiento del ecosistema y la viabilidad de las poblaciones a largo plazo, puede ser atribuido, entre otras cosas, al hecho de que los equipos de investigación en la mayoría de los países en desarrollo se encontraban en sus fases iniciales de desarrollo. Por lo tanto, no se puede esperar de ellos que dominen inmediatamente las complejidades de las cuestiones pesqueras consideradas en su más amplio contexto. Sin embargo, a medida que crece su capacitación y experiencia oficial - y esto puede hacerse más eficientemente si concentran sus actividades en las cuestiones del desarrollo y ordenación de las pesquerías que son más inmediatas, concretas y más fáciles de resolver - se podría esperar que amplíen progresivamente su campo de preocupación y presten más atención a las muchas complejidades de la ecología marina.

66. El impacto limitado que han tenido varios proyectos de ayuda en el desarrollo de las pesquerías nacionales puede atribuirse, en cierto grado, a las dificultades de comunicación con la administración y la industria, y a la falta de globalidad en la planificación sobre la forma de facilitar la ayuda. Frecuentemente los proyectos de investigación pesquera se han formulado y ejecutado sin que se preste suficiente atención a otros aspectos del desarrollo pesquero (tecnología de pesca, elaboración y comercialización de la pesca, etc.) y las investigaciones (en especial la biología marina). El ejemplo del programa bilateral Tailandia/Alemania (Anexo 12) y el de la ayuda multilateral a Cuba (Anexo 11) indica que, indudablemente, una planificación global y a largo plazo puede lograr mayores repercusiones y efectos duraderos.

67. Con el reforzamiento de las capacidades de planificación en los países beneficiarios, que ahora tienen la principal responsabilidad en la utilización de los fondos de ayuda internacionales, y con una mayor experiencia de las condiciones y requisitos locales obtenidos por las organizaciones de ayuda, estas limitaciones, es de esperar que progresivamente se superen. A este respecto, los organismos de planificación nacional tienen una importante función que desempeñar al garantizar la coordinación y distribución apropiadas de los programas de ayuda financiados con distintas fuentes, tanto bilaterales como multilaterales.

6.1.2 Ejecución de proyectos

68. Algunos proyectos han tenido dificultades en cuanto a cumplir simultaneamente los dos objetivos básicos mencionados anteriormente, a saber, la ejecución de las investigaciones y el reforzamiento de las capacidades de investigación. En gran parte, ello depende del personal del proyecto. Algunos proyectos se dedican principalmente a lograr conclusiones científicas y no siempre conpromenten plenamente a las instituciones y homólogos nacionales en sus diversas actividades de investigación. Otros no se integran ellos mismos suficientemente dentro de las estructuras e instituciones nacionales a las que estaban adjuntos. Ello afectó negativamente las comunicaciones entre los componentes nacionales y extranjeros del proyecto y la actitud general de las instituciones nacionales hacia el proyecto. A este respecto, el Grupo de Trabajo tomó nota de que los jefes de equipo internacionales y los directores nacionales tienen una especial responsabilidad para garantizar las buenas comunicaciones y colaboración entre los expertos nacionales y los homólogos nacionales, así como entre el proyecto y la administración nacional. El Grupo de Trabajo estimó que todo ello es tan importante como sus calificaciones científicas.

69. En general, se observaron frecuentemente grandes retrasos en la facilitación de expertos, equipo y en la ejecución de los proyectos. El Grupo de Trabajo recomendó que se evitara todo esto.

6.1.3 Experiencia

70. Las calificaciones de los expertos internacionales se consideran como uno de los principales factores del éxito o fracaso de los proyectos locales. Estos expertos deberán combinar una variedad de calificaciones: experiencia técnica, idiomas, habilidad para adaptarse y trabajar con personas de diferente cultura, etc. Estos requisitos explican la escasez de expertos que frecuentemente se observa. Esta situación se ve agravada por la disconformidad de los especialistas en ir al extranjero y una de las razones de su escasa movilidad es que frecuentemente son empleados del estado a los que las organizaciones internacionales no ofrecen la seguridad en un empleo que normalmente les otorgan sus instituciones nacionales. No estiman tener dicha seguridad cuando se incorporan en organizaciones internacionales temporalmente. Estas situaciones podrían mejorarse si los gobiernos y las administraciones nacionales adaptaran las condiciones que rigen en caso de permisos por ausencia y cesiones de personal.

71. Similares dificultades se encuentran en la selección de expertos nacionales (homólogos). Algunas veces se han seleccionado teniendo en cuenta sus calificaciones lingüísticas en vez de sus antecedentes científicos o sus futuras obligaciones. Hay que tener sumo cuidado en su selección y la planificación a largo plazo de sus carreras. La observación de sus actividades es también esencial y el jefe nacional y los expertos internacionales tienen una especial responsabilidad en la formulación y ejecución de procedimientos para evaluar los progresos y dificultades de los expertos nacionales.

72. En algunos países ha habido escasez de personal homólogo con suficientes calificaciones para un determinado proyecto. Esta situación puede tener diversas causas; por ejemplo, una falta general de fuerza laboral instruida en el país, la prioridad otorgada a otros sectores en la utilización de los expertos disponibles, etc. Algunas veces, la petición de homólogos para un determinado proyecto ha sido excesivamente importante para el país. La decisión de llevar a cabo el proyecto todavía puede tomarse cuando las capacidades del proyecto son esenciales para el desarrollo de las pesquerías nacionales. Cuando hay que dar menor énfasis al componente de capacitación del proyecto local, deberá tratarse y convenirse entre el gobierno y la organización que presta la ayuda cuando se formula el proyecto.

6.1.4 Equipo

73. Con frecuencia se han observado excesivos retrasos en la entrega del equipo y recambios. Ello puede afectar gravemente la ejecución del calendario del proyecto. Sin embargo, ya se ha tomado nota de que, con excepción del suministro de las embarcaciones de investigación y su equipo, por ejemplo, instrumentos para reconocimientos acústicos, la necesidad de contar con un equipo sofisticado es relativamente limitada en los estudios sobre evaluación de recursos. El equipo caro se necesita con más frecuencia en otras disciplinas, tales como estudios sobre contaminación u oceanografía, y en este caso la falta de material suficiente puede ser un factor limitado en ciertas circunstancias. Para facilitar la identificación del equipo y acelerar su entrega, la FAO deberá mantener y actualizar normalmente catálogos globales del equipo que se utiliza más comúnmente en las investigaciones sobre los recursos pesqueros.

74. Se tomó nota de que hay una tendencia entre varios estados en desarrollo de comprar equipo complicado que no siempre están en condiciones de utilizar a causa de su capacidad actual. Este equipo, no sólo incrementa el costo del proyecto sino que también plantea otros problemas, tales como los de mantenimiento y reparación, cuyos medios e instalaciones no siempre existen en el país.

75. Con respecto a las embarcaciones de investigación, el Grupo de Trabajo admitió que con la creciente importancia de los trabajos para observar y evaluar los recursos ícticos, es más necesario tener embarcaciones de investigación. Sin embargo, varias instituciones de investigación han encontrado dificultades insuperables para afrontar satisfactoriamente los costos de explotación y mantenimiento de las embarcaciones que han comprado o adquirido en los programas de ayuda. La adquisición de las embarcaciones de investigación deberá ser examinada con el máximo cuidado, teniendo en cuenta los recursos, tanto financieros como humanos, necesarios para su posterior utilización.

6.1.5 Medidas complementarias

76. Es necesario evaluar más profundamente los logros de los proyectos tanto por parte de los países beneficiarios como por las organizaciones de ayuda. La revisión de cuentas después del proyecto deberá preferiblemente incluir a personas que no han participado en las actividades del proyecto. Debido al lento desarrollo de las capacidades científicas, se deberá proceder a una segunda evaluación pocos años después de que se hayan completado los grandes proyectos.

77. Además, las actividades complementarias de los proyectos de investigación y creación de instituciones deberán recibir más atención. Como el desarrollo de las capacidades de investigación es un largo proceso, las nuevas instituciones de investigación establecidas necesitan ayuda, aunque con un índice decreciente, durante muchos años después de haberse completado los proyectos de ayuda. Hablando en términos más generales, con la progresiva creación de las capacidades nacionales hay un cambio en las necesidades de ayuda en el sector de las investigaciones pesqueras. Más que proyectos autosuficientes a largo plazo, varios países que actualmente tienen cierta capacidad científica y experiencia en el sector básico de las ciencias pesqueras, necesitan más visitas a corto plazo de consultores en materias especializadas (por ejemplo, en la proyección de programas de estudios sobre recursos o de planes estadísticos, en computadoras y elaboración de datos, en programación y planificación de las investigaciones, etc.).

78. Igualmente, las instituciones de investigación en los países en desarrollo necesitan becas para mejorar regularmente su personal de investigaciones. Necesitan organizar y asistir a grupos de trabajo y talleres regionales. Frecuentemente están tropezando con graves dificultades para movilizar, con sus propios presupuestos, los fondos para contribuir a estas actividades a corto plazo. La mayor parte de la ayuda en los proyectos de investigación no contiene ninguna disposición para cubrir apropiadamente estas actividades después de que terminan los proyectos, aunque estos insumos condicionan frecuentemente el firme establecimiento de los programas e instituciones de investigación que inicialmente han ayudado. Recientemente, los programas regionales de ayuda han facilitado cierta

ayuda sobre una base ad hoc a este respecto. Sin embargo, sus medios son generalmente insuficientes para satisfacer apropiadamente estas necesidades. Además, varias regiones no se benefician de los servicios de estos programas. Por lo tanto, el Grupo de Trabajo recomendó que estas necesidades a largo plazo se tengan en cuenta plenamente cuando se formulen los proyectos de ayuda y se hagan los planes para asistirlos por parte de las administraciones nacionales y las organizaciones de ayuda.

6.2 Proyectos para la Creación de Instituciones

79. Este tipo de proyectos es particularmente importante para el desarrollo de las capacidades científicas a largo plazo en los países en desarrollo. Sin embargo, sólo un número relativamente limitado de proyectos han tenido entre sus principales objetivos éste específico. Probablemente está relacionado con el hecho de que la decisión de llevar a cabo estos proyectos significa una serie de compromisos globales y a largo plazo que sólo pocos países en desarrollo han podido hacer hasta el momento presente. Igualmente, teniendo en cuenta la documentación presentada en el Grupo de Trabajo para su segunda reunión, parece ser que frecuentemente los países en desarrollo encuentran graves dificultades para mantener y reforzar sus unidades de investigación inicialmente establecidas con ayuda de los programas de asistencia.

80. Los fracasos al respecto parece ser que tienen varias causas interrelacionadas:

(i) Insuficiente atención prestada, al formular el proyecto, a la identificación de la apropiada institución homóloga; ello posteriormente no permite que las actividades que se desarrollan con la ayuda del proyecto puedan ser seguidas por la institución pertinente.

(ii) La incapacidad de la administración nacional de hacer pleno empleo de las capacidades de la institución nacional de investigación.

(iii) El nivel general de desarrollo económico en el país beneficiario, que más tarde no puede mantener la ayuda necesaria para las actividades de investigación, lo cual provoca una pérdida del personal capacitado, poco o ningún crecimiento y el desarrollo de programas de investigación en la institución investigadora.

(iv) La insuficiente ayuda prestada por el Gobierno para ampliar las actividades de investigación, como consecuencia de la escasa prioridad asignada al sector pesquero en el desarrollo de la economía nacional, o para investigar en la planificación del desarrollo de las pesquerías nacionales.

81. En efecto, se destacó la existencia de una administración nacional capaz de apoyar y hacer pleno uso de las conclusiones investigativas como algo que representa una condición esencial del éxito de los proyectos de creación de instituciones y, de manera más general, del desarrollo de las capacidades científicas nacionales. El Grupo de Trabajo mencionó los cambios políticos y administrativos como una causa importante del fracaso parcial de la ayuda a los proyectos de investigación. La necesidad de la continuidad, que se ha subrayado en varias ocasiones como condición para crear las capacidades científicas, es especialmente importante para el desarrollo de unas instituciones de investigación eficientes y autosuficientes.

82. Para superar las mencionadas limitaciones identificadas, son necesarios diversos métodos. Hay que tener en cuenta la existencia de estructuras institucionales y posiblemente la necesidad de enmendar o complementar las actuales a fin de que las actividades promovidas por el proyecto de ayuda queden incorporadas y más adelante se hagan cargo de la pertinente institución nacional. Habrá que buscar y planificar acuerdos a largo plazo, tanto por la administración nacional como por el organismo de ayuda, para garantizar suficiente continuidad en la facilitación de apoyo y orientación técnica para las actividades de investigación nacionales. Cuando las administraciones nacionales no tengan suficiente conciencia de las oportunidades que ofrecen las pesquerías para el desarrollo de sus economías nacionales, se prestará

la debida atención, al planificar la ayuda a los programas nacionales de investigación pesquera, a la necesidad de mejorar la evaluación de las oportunidades y comunicaciones pesqueras con las administraciones nacionales interesadas.

83. Entre los diversos planes que se han utilizado con éxito para proporcionar orientación científica en las instituciones de investigación en desarrollo, los acuerdos de hermanamiento entre las instituciones de investigación en desarrollo y los laboratorios adelantados han estimulado ciertamente gran interés. Dichos planes ofrecen varias ventajas básicas para proporcionar ayuda: duración y continuidad, flexibilidad y adaptación en el intercambio de expertos de mayor o menor categoría entre las instituciones hermanadas, responsabilidad dada a los jefes científicos en las instituciones en desarrollo para la identificación y ejecución de programas de investigación importantes, etc. Al mismo tiempo, ofrecen a las instituciones adelantadas nuevas oportunidades para estudiar otros ecosistemas y ampliar su experiencia. Este plan de cooperación está particularmente bien adaptado a la creación de instituciones, ya que puede proporcionar la orientación a largo plazo, evolutiva y altamente especializada que, como hemos visto, es muy necesaria.

84. Se han mencionado varios ejemplos de aplicación de este plan, entre los cuales la cooperación entre Tailandia y la República Federal de Alemania, que ha tenido un éxito particular (Anexo 12). Sin embargo, la FAO ha tenido dificultades para promover y utilizar este tipo de acuerdo. Hasta el momento, las dificultades administrativas encontradas al organizar esta cooperación se han superado mejor con los programas de ayuda bilateral. El Grupo de Trabajo opina que se debería recurrir más a este tipo de cooperación, especialmente en los proyectos de creación de instituciones. Manifestó la esperanza de que la FAO pudiera utilizar más frecuente este sistema para sus propios proyectos y continuar sus actividades para promover esta clase de asociación en la cooperación bilateral.

6.3 Proyectos entre Países

85. La Secretaría presentó los objetivos, funciones y actividades de los programas entre países realizados por la FAO con ayuda del PNUD y otros donantes, así como los actuales planes relativos a su ampliación. Los programas de ayuda regional de la FAO, tal como se establecen actualmente, no realizan normalmente investigaciones. Sus principales funciones son las siguientes:

(a) ayudar a las actividades de las instituciones nacionales y regionales (por ejemplo, órganos pesqueros) en problemas de importancia regional (acopio y difusión de estadísticas, evaluación de poblaciones, ordenación de poblaciones compartidas, etc.);

(b) ayudar y proporcionar información técnica para la cooperación entre los estados miembros sobre problemas comunes a varios de ellos cuando se pueden obtener beneficios con un sistema concertado - economía de escala, mejor aprovechamiento de la escasa experiencia;

(c) promover, mediante estudios básicos, la mejor comprensión de las oportunidades del desarrollo pesquero y necesidades de ordenación a nivel nacional y regional;

(d) proporcionar, a petición de los estados miembros, ayuda a corto plazo de expertos y consultores de proyecto en cuestiones altamente especializadas.

86. Hay planes para ampliar estas actividades en zonas aún no incluidas en los actuales programas y complementarlas mediante programas interregionales, cuya finalidad es facilitar la difusión de la información y experiencia entre las regiones y proporcionar ayuda a las actividades de importancia global (preparación de las hojas de identificación de peces, preparación de material de capacitación en materia de ordenación pesquera, etc.). La FAO también está ejecutando un proyecto global, cuya finalidad es realizar, con una embarcación de investigaciones proporcionada por Noruega, reconocimientos acústicos frente a las costas de varios países en los océanos Indico y Atlántico y formular métodos más simples para evaluar los recursos.

87. También se ha presentado al Fondo Provisional de las Naciones Unidas para el Desarrollo de las Ciencias y la Tecnología, una propuesta de proyecto. La finalidad de este Fondo será, en primer lugar, reforzar las capacidades de investigación de los países en desarrollo más bien que realizar investigaciones como tales. La propuesta de la FAO tiene por objeto promover la capacidad científica y tecnológica que los países en desarrollo necesitan para aprovechar plena y racionalmente los recursos pesqueros disponibles dentro de sus respectivas zonas económicas exclusivas.

88. El Grupo de Trabajo tomó nota con satisfacción de que estas diversas actividades entre países han mejorado notablemente los programas de investigación de recursos en las diversas regiones y han aumentado la competencia y cooperación entre los científicos nacionales. Además tomó nota de que un enfoque regional es especialmente importante en aquellas zonas en donde los recursos pesqueros están compartidos y los países tienen responsabilidades conjuntas para ordenarlos.

89. Algunos proyectos regionales, con sus contactos estrechos y personales con los científicos de la región, han tenido especialmente éxito para promover la cooperación entre los laboratorios ayudando a coordinar y normalizar las investigaciones relativas a poblaciones explotadas por más de un país, el intercambio de científicos entre los países en desarrollo y un mejor aprovechamiento de la escasa fuerza laboral y medios disponibles. Allí donde algunos países de la región han establecido la cooperación en materia de investigaciones, los proyectos han podido ayudarlos a que las desarrollen más.

90. Se estimó que una importante contribución al éxito de los talleres y otras actividades entre países afines era la posesión de fondos suficientes por parte de los proyectos regionales para ayudar a la plena participación de los expertos nacionales en estas actividades. Con ello se contribuirá a garantizar la más apropiada participación. Hablando en términos más generales, deberá prestarse más atención a los medios para garantizar un mayor contacto entre los científicos de los países en desarrollo. La asistencia a las reuniones científicas, así como a las operaciones deberá recibir más énfasis en relación con la capacitación mientras dura el servicio, y a través de un mayor nivel de estudios científicos y mejoramiento de la competencia científica. Igualmente los programas regionales deberán ayudar a los Estados Miembros a organizar cursos y seminarios de capacitación sobre cuestiones de importancia regional, facilitando becas siempre que sea posible, etc.

91. Los proyectos regionales también podrían proporcionar ayuda en la publicación de resultados de los grupos de trabajo y manuales en el idioma apropiado de la región.

92. El Grupo de Trabajo recomendó que deberían utilizarse los expertos e instituciones de las regiones. Podrían utilizarse varios sistemas para aumentar la utilización y, así, el fomento de expertos locales. Además de la contratación de expertos y consultores, los programas regionales deberán, en la medida de lo posible, recurrir a las instituciones de las regiones a las que prestan servicio. Los contratos de investigación se establecerán para estudiar cuestiones de importancia regional y dichos contratos podrían pagarse mediante la facilitación de material y fondos adicionales a los equipos nacionales pero también proporcionando insumos técnicos de expertos principales externos para las partes críticas de los programas de investigación (por ejemplo, planificación, interpretación de datos, etc.).

93. También se tomó nota de que hay muchas semejanzas entre las funciones del Programa Ordinario de la FAO y las funciones de los Programas Interregionales y Globales del PNUD. Teniendo en cuenta la gran experiencia que la FAO ha adquirido en el intercambio de información, métodos y experiencia entre las regiones - especialmente entre desarrolladas y en desarrollo - y la promoción de investigaciones sobre asuntos de importancia directa para la pesca en el tercer mundo, el Grupo de Trabajo destacó la necesidad de una plena coordinación y cooperación entre las actividades planificadas y financiadas en virtud de estos programas.

94. Además, el Grupo de Trabajo tomó nota de que la financiación de los proyectos regionales estaba afrontando ciertas dificultades. Todo ello estaba afectando a la ayuda que estos proyectos prestan para el reforzamiento de las capacidades de investigación de sus estados miembros, así como el incremento de actividades y la institución de programas similares en otras zonas geográficas.

7. CAPACITACION Y ENSEÑANZA

7.1 Disponibilidad y Calificaciones de Graduados y Técnicos

95. En algunos países en donde la prioridad para utilizar la fuerza laboral disponible ha de concederse a otros sectores (administración, enseñanza, etc.), la escasez de graduados ya capacitados en ciencias básicas, así como de técnicos familiarizados con las tecnologías pertinentes, ha sido temporalmente un factor que ha limitado el desarrollo de las investigaciones sobre los recursos pesqueros. Las consecuencias de esta escasez pueden ser más agudas cuando sus antecedentes generales en matemáticas y estadísticas es limitado. Estas limitaciones deberán ser tenidas en cuenta a nivel nacional, así como por parte de las organizaciones internacionales tales como la Unesco, al formular los programas de estudio para las escuelas secundarias y las universidades. Por lo tanto, el Grupo de Trabajo acogió con satisfacción las medidas tomadas por la FAO y la Unesco para desarrollar conjuntamente un programa de estudios relativo a las ciencias pesqueras que podría ayudar a las universidades a que formulen programas de capacitación en ese sector. Esperaba contar con sus recomendaciones pronto.

96. La capacitación de técnicos también contribuye al desarrollo del personal de investigaciones. En realidad, la distinción entre oficiales y técnicos de investigación no debe considerarse estadística sino dinámicamente, y deberá prestarse plena atención al proceso educativo que permita a los técnicos, con potencial para el desarrollo, alcanzar las calificaciones académicas y administrativas necesarias para ser científicos.

7.2 Capacitación Mientras Dura el Servicio

97. La capacitación mientras dura el servicio es generalmente parte integral de los proyectos de investigación de la FAO. Por lo tanto, es importante que los expertos internacionales seleccionados tengan capacidad para impartir sus conocimientos y que los expertos nacionales se elijan convenientemente para que puedan beneficiarse de ello y puedan continuar en el sector de acitividades abarcado por el proyecto. Sin embargo, los programas de capacitación más oficiales durante los proyectos de investigación tienen un valor considerable para capacitar otros funcionarios de investigación nacionales que no son específicamente homólogos. El Grupo de Trabajo recomendó que, siempre que procediera, se incluya en los documentos de los proyectos de investigación la realización de conferencias o cursos de capacitación.

98. No siempre se ha prestado la debida consideración al hecho de que la capacitación es un proceso que debe continuar durante la vida activa de los científicos y los técnicos. Deberán organizarse periódicamente cursos y seminarios dentro de cada laboratorio de investigaciones para capacitar a los científicos y técnicos de menor experiencia, tratar conclusiones investigativas de determinados científicos durante el curso de sus investigaciones y generar entre ellos la suficiente conciencia de las necesidades de investigación de las pesquerías nacionales. El Grupo de Trabajo estimó que la FAO podría desempeñar una función mucho mayor en estas actividades fuera de la duración de los proyectos. Recomendó que la FAO haga saber a los institutos de investigación, así como a las universidades de los países en desarrollo, que podrían recibir ayuda en forma de material de capacitación, conferencias para cursos y visitas por consultores para celebrar debates oficiales sobre cuestiones, metodologías y programas de investigación básica.

7.3 Manuales sobre Investigación de Recursos

99. El Grupo de Trabajo reconoció la muy importante función que los manuales de la FAO sobre ciencias pesqueras han desempeñado al ayudar a los biólogos de todo el mundo a adquirir métodos y sistemas para sus investigaciones sobre los recursos ícticos. Los manuales también han desempeñado una parte valiosa en los cursos de capacitación y, en realidad, varios se han iniciado con el material preparado para estos cursos. Su importancia para los investigadores de los países en desarrollo se ha visto evidentemente en las 60 contestaciones

recibidas en el cuestionario sobre la disponibilidad y utilidad de los manuales de la FAO y documentos afines (Anexo 7), enviados para el Grupo de Trabajo a principios de 1980. Aproximadamente el 60 por ciento de los que contestaron tenían ejemplares de los más importantes manuales de la FAO.

100. Sin embargo, la identidad de los manuales de la FAO como una serie distinta se ha perdido con su incorporación en las series de documentos técnicos sobre la pesca. Unas 22 publicaciones de dichas series llevan actualmente explícita la connotación de 'manual', pero son difíciles de identificar y no dan una cobertura coordinada. Su utilidad se vería considerablemente reforzada si se retuviera el concepto original de los manuales como series distintas de publicaciones planificadas para cubrir las diversas secciones de trabajo en las que participan los científicos pesqueros y si fueran actualizados regularmente para que incluyeran nuevos conceptos y métodos a medida que son aceptados generalmente. Necesitan estar preparados como manuales sin olvidar que los científicos de los países en desarrollo harán uso de ellos y que los leerán en su idioma materno.

101. Para establecer y mantener estas series de manuales, el Grupo de Trabajo recomendó la institución de un pequeño grupo editorial técnico, compuesto de personal de la Sede y científicos de pesca de los países desarrollados y en desarrollo. Este grupo debería trabajar por correspondencia y reunirse de vez en cuando si fuera necesario; tendrá la responsabilidad de planificar la cobertura de las series y supervisar la preparación, corrección y normalización periódica de los manuales. Los manuales serán gratuitos y se distribuirán a través de los canales pertinentes de la FAO.

102. La distribución regular de los documentos de la FAO, incluidos los manuales y documentos afines, entre los institutos de investigación deja mucho de ser completa. Por lo tanto, el Grupo de Trabajo recomendó que se examinaran las medidas de distribución y, en especial, que se actualice la Short Marine and Inland List[1].

103. Además se observó que ha habido una disminución en el número de manuales y documentos afines en materia de investigación de recursos que existían en más de un idioma de la FAO. Por lo tanto, deberá prestarse especial atención a la traducción de los manuales y documentos afines de la FAO en otros idiomas.

104. El Grupo de Trabajo admitió que la preparación de estos manuales y su traducción sería costosa y suscitaría dificultades especiales. A fin de facilitar el trabajo, recomendó que la FAO busque los fondos recurriendo a organismos externos y obtenga la colaboración de instituciones de investigaciones nacionales para producir los manuales en tantas lenguas como sea necesario para la adecuada difusión de sus contenidos.

7.4 Cursos de Capacitación

105. Los cursos de capacitación de la FAO en materia de investigaciones abarcan tres sectores científicos: (i) conceptos y métodos básicos en materia de biología pesquera; (ii) estadísticas y métodos de muestreo, y (iii) evaluación de poblaciones, reconocimientos acústicos y otros tópicos especializados. Durante el período 1972-79, cuando se han celebrado la mayoría de los cursos, había cinco métodos básicos, ocho en estadísticas y 14 en cuestiones especializadas. De los cinco métodos básicos, uno se celebró en Asia, otro en América Latina y tres en Africa.

106. Aunque los institutos pesqueros en desarrollo en muchos países están organizando cada vez más sus propios cursos de capacitación, estos cursos básicos todavía son muy necesarios y deberían aumentarse con frecuencia. En vista de los crecientes costos de los cursos de capacitación y la necesidad de abarcar nuevos sectores, la FAO debería buscar nuevas fuentes de financiación. También, como se menciona en la sección 7.2, hay verdadera necesidad de que la FAO esté en condiciones de prestar más ayuda a las instituciones y universidades de investigación nacional en los países en desarrollo en materia de planificación y administración de sus propios cursos, facilitando materiales didácticos, asesoramiento y uno o más directores para estos cursos. Los programas regionales, cuando tienen fondos suficientes, son particularmente aptos para ayudar a estos cursos.

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[1] Breve Lista Marina y Continental

107. El éxito de los cursos de capacitación requiere la participación de expertos con una comprensión apropiada de las necesidades de los países beneficiarios, de las características de la pesca en la región abarcada, de la disponibilidad de la fuerza laboral así como de las prioridades de capacitación. Recomendó que los cursos de capacitación se basen lo más frecuentemente posible en ejemplos locales. Estas condiciones no se satisfacen siempre.

108. Como los cursos de capacitación son caros en términos de fondos y fuerza laboral, es esencial que se planifiquen cuidadosamente. Las necesidades de ayuda financiera, así como los procedimientos administrativos para la preparación de los cursos, son generalmente muy intensas y podrían reducirse si los países organizaran los cursos localmente y los proyectos regionales hicieran lo mismo.

109. La necesidad de los cursos de capacitación especializados es probable que aumente a medida de que se disponga de métodos más complicados. Sin embargo, la función de los que tratan sobre evaluación de recursos a nivel superior se realiza en parte por los grupos de trabajo que se ocupan principalmente de los análisis de los datos de investigación pero que también proporcionan bastante capacitación.

7.5 Centros de Capacitación

110. La institución de centros regionales de capacitación ha sido propuesta en algunas ocasiones durante muchos años. Sin embargo, muy pocos se han establecido y el que ha tenido más éxito probablemente ha sido el Centro de capacitación para métodos de reconocimiento acústico en Lima, Perú, que funcionó bien durante cinco años. Otros han tenido menos éxito. Muchos factores tienen que favorecerlos para que continúen siendo viables y, en todo caso, es probable que transcurran varios años hasta que dichos centros estén establecidos. Sin embargo, cuando las condiciones son apropiadas, el Grupo de Trabajo piensa que estos centros podrían tener éxito particularmente si se relacionan con una universidad u otra institución de capacitación en las que progresivamente podrían integrarse.

7.6 Becas

111. No hay ningún análisis del número de becas concedidas en los últimos años ni de los países que envían estudiantes o de los institutos que los reciben. Tampoco hay datos disponibles sobre becas similares sin la ayuda de la FAO. Sin embargo, existe el resultado de un estudio experimental de la EXTRAGO sobre becas concedidas por la FAO en el sector de las ciencias pesqueras durante los años 1965-71. El 75 por ciento de las respuestas indica que hay problemas de insuficiente conocimiento de los idiomas apropiados, insuficiente importancia de la organización y la pérdida extensiva de cursillistas que se dedican a otros trabajos.

112. En la identificación de las necesidades, no siempre se ha hecho una clara distinción entre la facilitación de capacitación académica en las universidades extranjeras (becas) y las visitas a las instituciones de investigación (becas). El segundo plan se reservaría a los científicos ya capacitados en las materias básicas de sus disciplinas y preferentemente con algunos años de experiencia práctica. Los científicos visitadores se enviarían preferentemente a instituciones dentro de la misma región o a regiones en donde los recursos y las investigaciones pesqueras indican que hay suficientes semejanzas con las que probablemente encuentran en sus países de origen. La mejor duración de estas becas sería probablemente entre tres y seis meses y también hay necesidad de becas para países de otras regiones, en laboratorios que realizen investigaciones superiores sobre cuestiones de especial importancia para el trabajo del becario.

113. La selección de las condiciones más adecuadas y de los institutos más idóneos en donde trabajarían ha sido reconocida como de capital importancia. Los programas regionales tendrían gran parte de la información necesaria para efectuar las mejores selecciones.

7.7 Difusión de Documentos Científicos

114. El Grupo de Trabajo tomó nota de los progresos realizados por el ASFIS[1] y acogió con satisfacción los planes para que sus publicaciones y medios se conozcan más entre los científicos de pesca de los países en desarrollo. Sin embargo, la limitación de bibliotecas y medios para hacer préstamos de libros en algunos países en desarrollo hacen que los ASFA[2] tengan poco valor en muchos de estos países actualmente. El ASFIS podría ocuparse del problema específico de la difusión de la información en los países en desarrollo para ver cómo pueden satisfacerse sus especiales necesidades.

115. La mayoría de los informes sobre investigaciones de los laboratorios de los países en desarrollo están mimeografiados y su publicación se limita frecuentemente al departamento de origen. Se trata frecuentemente de problemas de publicación de documentos científicos y los retrasos pueden ser considerables. Los programas regionales pueden contribuir publicando documentos presentados a los seminarios regionales, pero ello tiene una limitación en cuanto a cobertura. Hay necesidad de publicaciones regionales sobre pesca, como el periódico del Consejo del CIEM, que facilitaría la publicación de documentos de interés regional.

116. Deberá investigarse la posibilidad de perfeccionar determinadas bibliotecas existentes convirtiéndolas en regionales con una gran cobertura, que ofrezcan préstamos especiales y medios para copiar a los países de la región, ya que la falta de bibliotecas se estimó por el Grupo de Trabajo como un importante obstáculo al desarrollo de la investigación científica en los países en desarrollo.

1/ ASFIS = Sistema de Información sobre las Ciencias Acuáticas y la Pesca

2/ ASFA = Resúmenes sobre las Ciencias Acuáticas y la Pesca

ANNEX 1

List of Participants
Liste des Participants
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ANNEX 2

List of Documents Prepared for and Distributed at the First Session
Liste des Documents Etablis et Distribués à la premiére session
Lista de Documentos Preparados y Distribuidos en la Primera Reunión

1. Contributed papers

1.1 A.C. Simpson: Resource research in developing countries
1.2 C. Tapias: Fishery research in Latin America
1.3 R.R. Prasad: Strategy for promotion of fishery resources research in India
1.4 FAO Secretariat: Training in fishery resources research; a brief account of FAO activity in this field
1.5 M. Lizárraga: The problems of transfer of technology in aquaculture
1.6 G. Saetersdal: Identification of the creational and functional elements of fishery research institutions
1.7 A.B.M. Mafeje: Development or economic growth
1.8 S.M. Haq: Intergovernmental Oceanographic Commission (of Unesco)
1.9 M. Ansa-Emmim: Present and potential role of interregional collaboration in fishery resources research in the CECAF region

2. Background documents

2.1 A.C. Simpson: The role of research in fishery development. FAO Fisheries Circular No. 720
2.2 J.A. Gulland: Problems and priorities in providing research input to fishery decisions. Oc.Dev. and Int.Law Journal Vol. 4
2.3 G. Saetersdal: Fish and fishery resources in world nutrition
2.4 Chr. L. Dawson: A comparison of national resources available for fishery research
2.5 G. Saetersdal: A note on the state of fishery research in the Northeast Atlantic
2.6 G. Saetersdal and G.H.P. de Bruin: A survey of the coastal fish resources of Sri Lanka
2.7 CMFRI, India: Marine Fisheries Information Service
2.8 J.-P. Troadec: Reflexions sur les programmes de recherche halieutique au Sénégal

ANNEX 3

List of Documents Prepared for and Distributed at the Second Session
Liste des Documents Etablis et Distribués à la seconde session
Lista de Documentos Preparados y Distribuidos en la Segunda Reunión

1. FIR, FAO (Rome): FAO Advisory Committee of Experts on Marine Resources Research; summary of questionnaires on sister institutes

2. G.L. Kesteven: Aid in research into fishery resources; an examination of experience in aid projects executed in Mexico, Peru, Chile, Argentina, Uruguay and Venezuela

3. G. Saetersdal: Report on a consultant assignment 22 January to 9 February 1980 on the organization of fisheries research in Mozambique

4. M. Azzou: Promotion de la recherche halieutique au Maroc

5. D. Menasveta and K.I. Matics: Technical assistance rendered by the Federal Republic of Germany to Thailand (1961-75) in marine fisheries research and development

6. A.B.M. Mafeje: Report on the United Nations Conference on Science and Technology for Development (Vienna, 20-31 August 1979)

7. A.C. Simpson: A review of the adequacy and availability of FAO manuals in fishery science

8. A.C. Simpson: A review of FAO training courses related to resource evaluation

9. M. Ansa-Emmim: Fishery Research Unit of Ghana - past and present

10. R.R. Prasad and G. Saetersdal: Review of the achievements of the Norway/FAO Pelagic Fishery Survey Project on the South West Coast of India

11. A. Mena Millar and M. Nikolic: Los logros y fallas de programas multilaterales (FAO) en el campo de la investigación de recursos pesqueros en Cuba (1961-79)

12. FIPP, FAO (Rome): A strategy for inter-country programmes of assistance and cooperation in fishery development and management

13. FAO (Rome): IFSTD Interregional project for the strengthening of research capabilities of developing countries for the rational utilization of the fish resources in the EEZ (project proposal)

14. FAO Secretariat: Summary of answers to questionnaire on the availability and usefulness of FAO manuals and related documents on fishery resources research

15. Anon.: Interim report of the first session of the ACMRR Working Party on the Promotion of Fishery Resources Research in Developing Countries

16. Anon.: Questionnaires on current state of fishery resources research in selected developing countries:

    Form I. National research institutions, programmes and budgets

    Form II. Fishery resources research institute personnel, programmes and equipment

ANNEX 4

Agenda of the Second Session
Ordre du Jour de la Seconde Session
Programa de la Segunda Reunión

1. Introduction

2. Assessment of the Present Situation
(based on the background material assembled during the inter-sessional period)

2.1 Current state of fishery resource research in developing countries

- present research objectives, priorities, programming, budget, expected changes in scope, emphasis, policies, etc.
- available staff, equipment, resources
- inter-country collaboration, etc.

2.2 The FAO training programme

- manuals (scope, format, distribution, availability, etc.)
- training courses and centres
- on-the-job training
- fellowships and scholarships, etc.
- financing and planning

2.3 Bilateral and multilateral aid programmes and policies

- bilateral assistance
- FAO national and regional field projects
- role of the FAO regular programme
- recommendations of the UN Conference on Science and Technology for Development

3. Recommendations for Improved Strategies and Tactics

3.1 Improving scientific skills

- national actions
- FAO training material (e.g., scope, format, need for new media, improved distribution, translations, etc.)
- FAO training courses (scope, coverage, approaches)
- other schemes (interchange of experts, fellowships and scholarships)

3.2 Dissemination of scientific literature

- ASFIS
- loans of publications among libraries in a region
- provision of photocopying services, etc.

3.3 Upgrading national research institutions

- national fishery research policies (purpose, support, use of research, etc.)
- upgrading research organizations (communications, institutional structure)
- research programming and execution

3.4 Inter-country collaboration

- regional working parties, joint research activities, coordination of national research programmes, interchange of experts
- sub-regional research institutions
- larger use of expertise and institutions of developing countries by the international community

3.5 Aid projects

- complementarity and specificity of bi- and multilateral aid projects
- needs for change in policy and emphasis in bi- and multilateral aid projects
- the role of FAO regional fishery bodies and programmes

4. Conclusions

ANNEX 5

The Fishery Research Unit of Ghana: Past and Present

by

M. Ansa-Emmim
FAO/UNDP Interregional Fisheries Development
and Management Programme
Dakar, Senegal

1. INTRODUCTION

A request by the Government of Ghana to the United Nations Expanded Programme of Technical Assistance (EPTA)[1] in the early sixties recognized the important contribution to be made by marine fisheries in meeting the increasing food demand of the rising population and the need for increasing the national revenue. One FAO biologist and a Japanese expert recruited by the Government worked in Ghana from 1962-64 under this programme to lay the foundation of fisheries science with local counterparts. The primary objective was to establish a long-term programme including all necessary sectors of marine biological research and to train local staff. Specifically, the programme was to study the biology of Sardinella aurita, study the fishery of Caranx hippos and assess important demersal stocks. It was realized from the beginning of the EPTA programme that the scope was too small to cover the whole spectrum of fisheries research. A request therefore was sent to the United Nations Special Fund for the establishment of a Fishery Research Unit (FRU) in 1961. This was accepted by the Special Fund in 1965 and a plan of operation signed by the Government of Ghana in 1966 with FAO as the executing agency and the Ministry of Agriculture as the cooperating agency. The five year project became operational in October 1966. A new fishing technique programme began in January 1972.

The aim of this paper is to review the assistance programme and highlight the successes, failures and also discuss the present status of the FRU.

2. PROJECT ACTIVITIES

The objective of the Project as described in the plan of operation was "to assist in the development of fisheries through the establishment and operation of a fishery research unit".

As requested by the Government of Ghana, the research programme must "maintain a continuous watch on the resource which will enable information to be provided to the Government which will form a sound basis for future fisheries development, planning and capital investment".

The research programme of the Project therefore had the following objectives:

(i) to study the biology and population dynamics of the sardinella with special regard to expanding the fishing season;

(ii) to study the composition of the demersal fish stocks and the effect of fishing on these stocks;

(iii) to study the distribution of tropical tunas and horse mackerel (Caranx hippos);

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[1] The United Nations Special Fund and the Expanded Programme of Technical Assistance were merged to form the United Nations Development Programme (UNDP) on 1 January 1966

(iv) to study fishing techniques in use with the aim of improving them;

(v) to study the hydrography and plankton in order to understand the biology of important commercial species.

3. BUDGET OF THE PROJECT

On the whole, the Special Fund Allocation was US$1 112 100. The Special Fund Allocation was made up as follows:

	US$
Salaries, internationally recruited staff	1 013 900
Fellowships	50 000
Equipment (fishing gear, laboratory, workshop, vehicles, publications)	240 000
Miscellaneous expenses	49 000
Participating and Executing Agency overhead costs	160 000
Special Fund direct costs	2 500
	1 516 800

The Ghana Government contribution was as follows:

Total counterpart contribution in kind	960 000
Government contribution towards local operating costs	152 100
	1 112 100

The Government contribution included salaries of counterpart staff (both technical and administrative), buildings (laboratories, workshops, accomodation for experts, etc.) and running and maintenance costs for equipment. The Government also provided three vessels for the Project. The main fishing vessel R/V RESEARCH, a steel built 22 m stern trawler bought by the Government from Yugoslavia and delivered in February 1967, was converted to also make her suitable for purse seining. The other vessels were R/V KOKOTE (12 m) used for exploratory and (partly) hydrographic work and R/V SAKUMO (14.9 m) for hydrography.

4. PERSONNEL

According to the plan of operation, the following professional staff were to be recruited:

International staff

Project Manager/Fisheries Biologist	1
Fisheries Biologists	5 (2 demersal, 3 pelagic)
Planktologist	1
Fishing technologists	3 (1 gear, 2 fishing techniques)
Fisheries economist	1
Consultants	Various fields

Counterpart staff (under plan of operation)

Project Co-Manager/Fisheries Biologist	1
Fisheries Biologists	6
Technologists	3
Fisheries economist	1
Master fishermen	2

The Government also provided twelve technicians and assistants, fishermen for the research vessels, an administrative officer and his supporting staff, mechanics and fitters for the maintenance of the research vessels. The Government could not, however, provide the three gear technologists and master fishermen.

At the request of the Ghana Government, UNDP also provided a naval architect and boatyard superintendant to assist the Boatyards Division of the Ghana Industrial Holding Corporation during the life of the Project.

The international staff also included consultants in population dynamics, naval architecture, oceanography, planktonology, gear and fishing techniques and a librarian to organize the library of the FRU.

5. WORK PROGRAMME

Before the commencement of the UNDP Project, a small research centre was established in Tema by the Fisheries Department during the EPTA programme. This centre carried out most of the basic research work, establishing the occurrence of the seasonal coastal upwelling: a phenomenon which has a strong influence on the sardinella fishery of Ghana. This was established through routine monitoring of beach temperatures and salinities and also hydrographic transects using the two wooden vessels (SAKUMO, 18 m and KOKOTE, 12 m) during the early sixties. Work on the biology of *Sardinella aurita*, identification, seasonal distribution and abundance of zooplankton was also initiated during the EPTA programme.

It was also established during this programme that the intensity and duration of the upwelling had a direct effect on the *S. aurita* fishery. By the end of this programme, three Ghanaian biologists had been trained in basic fishery research work. These studies were expanded during the UNDP FRU Project to cover the following fields:

(i) Hydrography and plankton

This covered weekly transects off Tema and also monthly transects off Keta, Tema, Winneba, Cape Coast, Takoradi and Axim. Temperature, salinity and oxygen samples were taken on these transects in conjunction with plankton including eggs and larvae of pelagic species. Beach temperatures and salinity records were also taken at several stations along the Ghana coast.

(ii) Population dynamics of pelagic species, especially the sardinella

Sampling of commercial catches was the main source of information for studies on the biology of pelagic species, especially the two sardinella species; the catches and cpue of the commercial fleets (canoes and purse seiners) were also studied. Monthly acoustic surveys were conducted to estimate the abundance and distribution of pelagic species. To map out the distribution and migration and also the effects of fishing on the sardinella, especially *S. aurita*, a tagging programme was conducted.

(iii) Population dynamics of demersal species, especially the Sparids

Monthly trawling surveys of the transects between 10 and 40 fathoms were conducted to map out the distribution, abundance, biology and population dynamics of demersal stocks, especially Sparids. In addition, the catches of commercial trawlers were sampled for biological studies. Catches and cpue data of these trawlers were also analysed.

(iv) Survey of shrimp resources

Biological studies and exploratory fishing trips were conducted on the large penaeid shrimp *Penaeus duorarum* and the coastal shrimp *Parapenaeus atlantica*.

(v) Fishing techniques

This included trials of new fishing methods to make it possible to extend the sardinella fishery throughout the year. Extensive light fishing experiments were conducted. Improvements were made to the purse seine nets used by the local purse seine fleet. Attempts were made to improve the gear used by the artisanal fishermen.

(vi) Economic studies

The Unit initiated studies into the profitability of inshore wooden vessels built in Ghana.

- Advisory Committee

The Fishery Research Unit had an Advisory Committee appointed by the Government, made up as follows:

The Principal Secretary of the Ministry of Agriculture (or his representative) who acts as Chairman; a representative of the Ministry of Agriculture, the Director of Fisheries; a representative of the State Fishing Corporation; a representative of the University of Ghana (Legon); a representative of the Ghana Food Marketing Board; the Project Manager; Co-Manager; the FAO Country Representative; the Resident Representative of the United Nations Development Programme and other expert advisers as necessary. The terms of reference of the committee were:

"(a) Advise on the broad policy of the work to be undertaken by the Fisheries Research and Development Unit and serve as the channel for communicating to the Government essential information obtained as a result of the project which might assist the Government in the formulation of its policy of developing fishing industries and increasing fish production;

(b) Promote coordination of activities in fisheries research, technology and marketing directly related to the project for the development of the fishing industries in Ghana;

(c) Assist the project personnel to cooperate and maintain liaison with international organizations in any part of the world relating to the development of fishing industries and research on specific problems of fisheries research, technology and marketing;

(d) Advise on the collection and dissemination of information in order to secure full use of the results of fish biological, technological and marketing research achieved by the project;

(e) Advise on the administration of the funds, facilities and manpower made available by the Government and other national agencies to the project for research and other developmental work;

(f) Administer funds made available to meet the Government's responsibilities for scholarships or fellowships, which they grant in addition to those granted by the Special Fund and which are tenable in Ghana or abroad and are intended for individuals working on the project;

(g) In consultation with various bodies having an active part in the project to advise on the selection and appointment of the professional and auxiliary counterpart personnel and on their remuneration and conditions of service;

(h) Consider the annual estimates of the project prepared by the Project Manager in consultation with the Co-Manager;

(i) Receive once a year a report by the Project Manager and Co-Manager of the activities of the project during the preceding year and a statement of the programme of work for the coming year and, after considering the report, submit it to the Government."

- Relations with other institutes

Language barriers to a large extent prevented the FRU from establishing relationships with fisheries research institutes in the French speaking West African countries. The FRU however maintained contact with the research department of the Federal Department of Fisheries, Lagos, Nigeria. None of the other English speaking West African countries had a fisheries research institute during the early sixties. With the establishment of FAO/UNDP fishery projects in several West African countries, the FRU was able to develop cooperation with the research institutes in the French speaking West African countries. Fruitful cooperation, including exchange of scientists and data was established with the "Centre de recherches océanographiques (CRO)" in the Ivory Coast. This was for the mutual benefit of the two countries since both exploit the same sardinella stocks. Relationships were also established between the FRU and research institutes in Canada, USA, United Kingdom, Federal Republic of Germany, Norway and Japan. Contact was also made with the World Data Centre, Washington, USA, for the processing of hydrographic data (temperature and salinity) collected by the FRU.

Special relationships were also established with the University of Ghana, Legon, and later with the University of Cape Coast, also in Ghana.

The FRU received students from universities in the Federal Republic of Germany, who worked on specific research programmes.

6. PROJECT EVALUATION

The FRU Project had an impact on the Ghanaian fishing industry. As a result of the activities of the Project a symposium on the Ghanaian Fishing Industry was held in 1972 to discuss problems of theindustry. The symposium was attended by representatives from Government and industry and it provided a forum where proper understanding of the problems of the industry were appreciated.

Evaluation of the Project will be discussed under the following headings:

(i) Increased knowledge on the fisheries resources of Ghana
(ii) Contribution in strengthening national scientific skills
(iii) The establishment of a national research institution
(iv) Development of local fishery research facilities
(v) Limitation of the Project

(i) Increased knowledge on the fisheries resources of Ghana

The establishment of the FRU had a very marked impact on the improvement of the knowledge on the fishery resoruces in Ghanaian waters and adjacent seas.

Environment (hydrography and plankton)

The hydrographic and plankton programmes of the FRU made it possible to confirm the occurence of two coastal upwelling seasons (a major one from July to September and a minor one in January-February). A committee set up (the Ghana National Committee on Oceanic Research) attempted to explain the causes of the coastal upwelling. The work of this committee revealed that there are important difference between the causes of upwelling off Ghana and that observed in other areas. No simple driving mechanism is apparent. It is suggested that waves of oceanic origin might play an important role in the phenomenon. Research is still in progress concerning this problem.

The regular plankton surveys of the Unit and subsequent analysis threw light on the abundance, distribution and dynamics of zooplankton on the continental shelf of Ghana. Attention was paid to copepods, especially *Calanoides carinatus*, which constitute the major food item for the sardinella, as well as to the eggs and larvae of pelagic fishes, especially sardinella, *Anchoa guineensis* and *Harengula rouxi*.

Assessment of fish stocks on the continental shelf of Ghana

The biology and population dynamics of the main fish stocks on the shelf of Ghana were studied. These studies laid scientific foundations for the management of these stocks.

Pelagic stocks

The main areas of concentrations of the *S. aurita* and the seasonal migrations were described. The potential catch of *S. aurita* was about 50 000 t. Already during the life of the project it was detected that the *S. aurita* stocks were heavily fished and the further expansion should be limited.

Biological parameters investigated included spawning, age and growth, feeding, maturity, fecundity and mortality. Biological work was also done on *Scomber japonicus*, *Anchoa guineensis* and *Harengula rouxi*. The inshore-offshore migration of *S. aurita* and *Scomber japonicus* were established. The biology of the horse mackerel (*Caranx hippos*) was the subject of a thesis for a Master of Science degree submitted by a national scientist to the University of Ghana.

Demersal stocks

Preliminary trials in 1969 delineated grounds suitable for trawling. Catch rates for demersal fish at different depths and areas were calculated. The richest fauna was found to be between 20 and 25 fathoms.

Seasonal variations in abundance was linked with the upwelling. Species composition of trawl catches showed that 11 species together accounted for 65 percent of the total weight. The seabreams (Sparidae) were the most important group and accounted for 20 percent of the total weight. The standing crop of demersal fishes was estimated to be 34 000 tons. It was felt at the time that the demersal stocks were moderately exploited, with stocks within 50 m approaching full exploitation and those in deeper waters, 50-120 m apparently lightly fished. The biological parameters studied included spawning, migrations, maturity and growth.

The main fishing grounds for the pink shrimp *Penaeus duorarum* were mapped out. The shrimp surveys and data from logbooks indicated an annual sustained yield of about 400 tons.

(ii) Strengthening of national scientific skills

Training of local staff formed an important component of the project. National scientists were given on the job training as well as overseas training in hydrography, zooplankton, phytoplankton, fishery statistics and computer studies, fisheries biology, stock assessment, pollution monitoring and gear technology. The technical staff were also given local as well as overseas training in laboratory techniques. Under the plan of operation the following fellowships were provided to train local scientists and technicians in overseas institutions:

Fisheries biology	60 man months
Hydrography and plankton	24 " "
Fishing gear and techniques	24 " "
Fisheries economics	12 " "
	120 " "

- Special relationship with the University of Ghana:

Special relationships were established with the University of Ghana for scientists working in the FRU to present specific projects for higher degrees and for lectures to be delivered by scientists of the Project to students on marine fisheries topics.

- Publications

Research findings were published in two series: the Marine Fisheries Research Reports and the Information Reports. Annual reports containing summaries of research findings and programmes were also published.

- Seminars

Monthly seminars for scientists were organized. At these seminars status of research conducted by scientists were discussed. Such seminars were sometimes organized at the University of Ghana.

- Library of the FRU

To back up the work of the scientists, a library was established within the FRU. This was the most up-to-date marine library in the country with text books on all aspects of marine research (oceanography-physical and chemical; plankton; marine pollution; fisheries biology; physiology of fishes; fish stock assessment; fishing techniques; processing technology; naval architecture; economics; statistics; etc.).

The library had current periodicals (both local and foreign); FAO and Unesco manuals and publications, and scientific publications (both local and foreign research institutes). UNDP provided a consultant for three months to help organize the library and train local staff. The library now has over 500 books, 55 monographs, 33 current publications and over 1 500 pamphlets.

(iii) Establishment of a national research institution

The Fishery Research Unit was successfully established during the five years of the project. The principal recommendation made in the terminal report of the project was that the Research Unit "should be allowed to continue and develop its work". The terminal report also recommended that "government backing, which during the project was understanding and generous, should continue". The Unit continued and expanded the work started by the Project.

By the end of the project, there were ten Ghanaian scientists at the Unit, most of them trained in the best fisheries research institutes in the world. These scientists had extremely good technical assistants to back their work. It became a semi-autonomous body within the Fisheries Department with its own budget. At present, it is the only research institute not under the Council for Scientific and Industrial Research (a corporate body).

- Present work of the FRU

The FRU has tried, despite the present constraints, to continue the research work started by the project. At present, the FRU comprises three divisions, namely, Environment, Fish Stocks and Fisheries Statistics and Fishing Techniques.

The Environment Division continues to monitor environmental changes likely to affect the fisheries. These studies include temperature, salinity, oxygen, turbidity, wind and current fluctuations in the depth of thermocline, nutrients (PO_4, NO_2 and NO_3), pollution, phyto- and zooplankton. Studies on the upwelling initiated by the project are continuing.

The Fish Stocks and Statistics Division studies the biology and population dynamics of commercially important marine fish stocks (including tunas) and the collection, analysis and dissemination of marine fisheries statistical data. The recommendation made in the terminal report of the project to transfer the responsibility for the collection and analysis of fishery statistics from the Fisheries Department to the FRU was implemented.

The Fishing Techniques Division is charged with investigating current fishing gear used by the industry, especially the artisanal sector, with a view to improving them.

- Present staff

The FRU is presently understaffed. This is seriously affecting all research programmes. The FRU progressively lost most of its well trained personnel. At the end of 1978, there were only four professional staff, including the director. The main reason for this situation is the poor service conditions. The FRU is still part of the Fisheries Department and all staff are therefore governed by the civil service conditions. Attempts to make it an autonomous body within the Ministry of Agriculture at the termination of the project failed because of administrative problems within the Fisheries Department. Recruitment of professional staff has been difficult because the FRU competes with other institutes for the few graduates in natural science, owing to the civil service conditions of service, the FRU is always at a disadvantage.

At present, there are six professional staff and twenty three technical staff. One solution to this staffing situation would be to raise the status of the FRU to a full research institute with the same conditions of service as other institutes in the country. This will also ensure the recruitment of high quality research scientists. Almost all research institutes in Ghana are placed under a central research organization - the Council for Scientific and Industrial Research (CSIR).

Another solution, if it is administratively not possible to raise the status of the FRU within the Ministry of Agriculture with the same service conditions as other research institutes would be to transfer the FRU to the CSIR.

- Budget

The budget for the 1979-80 fiscal year was 1.9 million. This amount is for both recurrent and capital expenditure. Taking the present programme and staff into consideration the budget seems adequate. Like other institutions and organizations in Ghana, the FRU has a serious foreign exchange problem. It has not been possible to replace old equipment and import new ones. Current periodicals, scientific journals, and books cannot be easily imported. Professional staff cannot attend scientific meetings organized outside Ghana. This requires serious consideration of the government in view of the important role being played by the FRU.

- Vessels

The FRU has three research vessels, two of which are farily old and breakdown too often. R/V SAKUMO (14.9 m) is a wooden vessel used for oceanographic work. The second vessel is R/V SANGONAA (12.1 m), also wooden and used as a demonstration vessel in fishing techniques. The third vessel, R/V KAKADIAMAA (29 m) is a modern research vessel donated to the Ghana Government by the Japanese Government in August 1979. This is being used for surveys and exploratory fishing.

- Relationship with other institutes

The FRU continues to maintain its traditional contacts with fisheries research institutions in West Africa, Canada, USA, United Kingdom, Federal Republic of Germany, Norway and Japan.

Due to the cooperation between the FRU and the Centre de recherches océanographiques (Abidjan, Ivory Coast), a joint meeting was held in Abidjan, in 1976, to discuss the state of sardinella stocks off Ghana and Ivory Coast. Joint research programmes, including surveys, are undertaken to look at scientific problems. The two institutions continue to exchange data. Exchange of scientists is limited now because of financial constraints. The two institutions are considering using the research vessel of the FRU for joint surveys.

The special relationships established between the University of Ghana and the University of Cape Coast, also in Ghana, continue. Under these arrangements scientists from the FRU continue to teach marine science and fisheries courses at the two universities.

- Publications and library

The FRU continues to publish the Marine Fisheries Research Reports, the Information Reports and Annual Reports. The FRU maintains its library but has problems in renewing subscriptions and importing books.

(iv) Development of local fishery research facilities

The UNDP made provision of US$240 800 which were used to fully equip the FRU in laboratory and oceanographic research apparatuses and gear. The Government of Ghana provided research vessels, buildings, office and some laboratory equipment.

Most of the equipment need to be replaced. The combination winch, hydraulic components, caterpillar diesel engine, Simrad SK-3 with sonar scope, Simrad echosounder EK38A with echoscope were all installed on the R/V RESEARCH. This vessel has now been scrapped.

(v) Limitations

A major setback to the work of the project was the lack of national technologists to work with the UNDP/FAO staff. Work in the field of fishing techniques was therefore limited. Subsequently, the Government included in the 1972-76 Country Programme a two year assistance programme in fishery development in view of this weakness. The purpose of this follow-up project was "to evaluate modern fishing techniques and assess their impact on the development of the fishing industry. In particular to develop and demonstrate the following techniques: - light fishing in deeper waters to extend the three month season of sardinella - mechanized purse seining with power-block - mid-water trawling and a two boat system of trawling - shrimping". The total UNDP contribution of this two year follow-up project was US$363 100 and the Government contribution was US$160 000. Results of the follow-up project will not be discussed here.

Not much work was done on the biology of tropical tunas during the project. The plan of operation specified however that studies on the distribution and biology of tropical tunas will be undertaken. The tropical tunas are of great economic importance to Ghana. Studies on the tropical tunas now form an important part of the biological programme of the FRU.

Another important area that did not receive attention during the project was socioeconomic studies, although the plan of operation specified that these studies would be conducted.

7. DISCUSSIONS AND CONCLUSIONS

A Fishery Research Unit was successfully established in Ghana as a result of activities by the UNDP/FAO Project. This was possible because of the support of the Ghana Government and the enthusiasm of the staff. The assistance significantly contributed to the development of the Ghanaian fishing industry by providing basic scientific information on the fish stocks required for rational exploitation and management. Research capabilities of the Ghanaian fishery scientists and technicians were improved. Although the Project was not able to cover all the items under the objectives of the research programme, the research pro-programme has been expanded to cover tropical tunas. Studies on the phenomenon of the seasonal upwelling are continuing as well as those on hydrography and plankton.

The FRU faces staffing as well as financial problems. The FRU is now understaffed. Like other institutions in Ghana, the FRU lacks foreign exchange to import equipment, chemicals and scientific literature necessary for research programmes.

At the termination of the Project, the FRU was part of the Fisheries Department. Several attempts were made to make the FRU an autonomous body within the Ministry of Agriculture. All these attempts failed because of administrative problems within the Fisheries Department. The FRU has a vital role to play in the development, rational exploitation and management of the marine resources of Ghana in particular and in the CECAF area as a whole. But, for discharging adequately its duties, the present level of the FRU has to be raised to a full research organization with conditions of service similar to other research institutions in the country to attract more, and good, scientists.

Support of UNDP should have been continued even after the termination of the project, to ensure smooth transfer of project activities to Government. In view of the shortage of foreign exchange, funds should have been made available for the purchase of equipment, chemicals and the renewal of subscription, etc. Some consultant man-months could have also been set aside by UNDP for visits of experienced scientists.

The advisory committee was useful and it should be revised. Its terms should be revived to include active participation of members in identifying areas of research, planning of programmes and discussion of various management options formulated by the FRU. It should also serve as channel for communicating to the Government and industry essential research results especially those affecting the management of resources. The Government, fishing industry and the University of Ghana should be represented on the Committee.

ANNEX 6

Training in Fishery Resources Research: A Brief Account of FAO Activities in this Field

by

The Secretariat
FAO, Rome, Italy

1. INTRODUCTION

The purpose of this document is to present basic information on the activities conducted by FAO in the field of training in fishery resource research and the promotion of scientific capabilities of developing countries. The document reviews successively:

- the training courses and seminars organized or planned by FAO, alone or in collaboration with other agencies, during the period 1975/80 (Part I);

- the manuals on fishery resource science published or under preparation by the Fisheries Department (Part II); and

- the training activities - and their impact on the promotion of scientific skills - conducted by the working parties and similar structures established within the framework of the FAO regional fishery bodies and other related programmes or projects (Part III).

The respective roles of these various forms of action are not easy to distinguish; nor is their impact easier to evaluate, at least in a quantitative fasion. Even if persons who have been involved over a sufficiently long period can get some idea of the effects of these various actions, it is hardly possible to separate their effects from those of other influences, among which the overall development of the countries, the greater availability of graduate students, a greater attention paid to the potential input of research by national fishery administrations and industries, the activities of non-FAO bodies, etc., could be specifically mentioned.

A fourth sector should have been covered by this review, i.e. the training elements (fellowships, on-the-spot training) of the FAO/UNDP field projects. For operational reasons, it has not been possible to complete this compilation before the meeting. However, it is intended to undertake such a review immediately after the meeting.

In the first two parts of the document, the data compiled have been presented separately for the following fields:

I. Fishery statistics
II. Fishery biology
III. Resource surveys
IV. Stock assessment and fishery management
V. Inland water resources
VI. Pollution
VII. Aquaculture

In general, only factual information is provided. Only under the short comments given on the past performances and future developments of the activities of fishery bodies working parties is some assessment given, together with some identification of the basic constraints as well as of possible approaches.

It is hoped that, although incomplete, this short account will help the participants to assess the training programme of FAO in the field of fishery resource research. In particular, the Round Table may analyze and make comments on:

1. the scope of the FAO training programme and the relative importance given to the various fields, e.g. fishery statistics, resource evaluation, pollution or aquaculture, etc.;

2. the vehicles used, i.e. the media (manuals, training courses, working parties, etc.) and the format used in each of them;

3. the advisability for FAO to develop its collaboration with other organizations, such as UNESCO, for the preparation of manuals or for the preparation and execution of training courses on subjects of mutual interest (e.g. sampling marine populations, ichthyoplankton and eggs and larvae surveys, etc.);

4. whether the present arrangements for the financing of such activities are adequate and, if not, what improvements could be made.

PART I: 1975/80 LIST OF FAO TRAINING COURSES IN FISHERY RESOURCES RESEARCH

Title	Location	Duration	Subjects covered	Level	Lang.	No. of participants	Invited countries/ regions	Funding
I. FISHERY STATISTICS								
Sampling and Statistics	Cartagena (Colombia)	2 days September 1976	Sampling design for complex fishing and the statistical efficiency of acoustic surveys	University	E	Ministry staff	Colombia	INDERENA
Training Course on Fishery Statistics	Monrovia (Liberia)	1 month Sept/Oct 1976	Introduction to sample surveys; the stratification of the fisheries in Liberia; catch assessment surveys; preparation of the results	Elementary and Intermediate	E	All staff of fishery bureau	Liberia	RAFR
Training Course on Fishery Statistics	Tema (Ghana)	3 weeks Oct/Nov 1976	System of large-scale fisheries statistical surveys; sampling techniques; statistical methodology; quality control methods; statistical aspects of echo surveys; desk computer; cost earning surveys; a case study	Intermediate	E	28	Ghana	RAFR
Training Course on Fishery Statistics	Lagos (Nigeria)	3 weeks November 1976	System of large-scale integrated fishery statistical surveys; sampling techniques with special emphasis on line sampling; sampling and non-sampling error; quality control and coverage check surveys	Advanced	E	18	Nigeria	RAFR
Training Course on Fishery Statistics	Lomé (Togo)	3 weeks October 1976	Concepts statistiques fondamentaux; planification d'une enquête-cadre; enquête d'évaluation des captures; estimateurs statistiques	Intermediate	F	20	Togo	RAFR

Part I (cont.)

Title	Location	Duration	Subjects covered	Level	Lang.	No. of participants	Invited countries/ region	Funding
I. FISHERY STATISTICS (cont.)								
Training Course on Fishery Statistics	Banjul (Gambia)	1 month Oct/Nov 1976	Frame survey; catch assessment survey	Elementary and Intermediate	E	Ministry staff	Gambia	RAFR
Training Course on Fishery Statistics	Cotonou (Benin)	2 weeks Oct/Nov 1976	Concepts statistiques fondamentaux; planification d'une enquête-cadre; enquête d'évaluation des captures; estimateurs statistiques	Intermediate	F	13	Benin	RAFR
Training Course on Fishery Statistics	Abidjan (Ivory Coast)	3 weeks December 1976	Enquête-cadre; enquête d'estimation des captures	Intermediate	F	10	Ivory Coast	RAFR
Training Course on Sampling and Statistics	Cartagena (Colombia)	5 days June/July 1977	Sampling techniques	University	E (S)	32	Colombia	INDERENA
Training Course on Fishery Statistics and Sampling	Tenerife (Spain)	3 weeks April/May 1978	Sampling artisanal and large-scale fisheries; data to be collected, processing, etc,	Graduate	E F S	42	Member countries of the 3 sponsoring fishery bodies	CECAF ICCAT ICSEAF
Training Centre in Fishery Statistics	Manila (Philippines)	5 weeks Oct/Dec 1978	General fishery statistics		E		SCSP member countries	FAO/UNDP South China Sea Programme
National Courses in Fishery Statistics	Tema (Ghana)	2 weeks January 1979	The use of statistics for fisheries development and management; introduction to statistical methods	Intermediate and Advanced	E	34 + 15	Ghana	RAFR

Part I (cont.)

Title	Location	Duration	Subjects covered	Level	Lang.	No. of participants	Invited countries/ regions	Funding
I. FISHERY STATISTICS (cont.)								
Séminaire de formation sur les techniques de recueil et d'établissement des statistiques des pêches	Dakar (Senegal)	3 weeks Jan/Feb 1979	Concept de base utilisé dans les enquêtes statistiques; conception des enquêtes statistiques halieutiques; enquête-cadre; enquête de production	Elementary and Intermediate	F	24	Senegal Mauritania Mali Niger Upper Volta Ivory Coast	CEAO[a/] FAO
National Courses in Fishery Statistics	Lagos (Nigeria)	2 weeks February 1979	Frame surveys; catch assessment surveys	Intermediate	E	25	Nigeria	RAFR
Training Course on Fishery Statistics	Kuwait	4 weeks February 1979	Sampling methods; design and implement of statistical surveys; mechanical processing of the results of large-scale fisheries surveys	Advanced	E (Arabic)	22	Kuwait, A.R. Yemen Jordan Syria P.D.R. Yemen Saudi Arabia Sudan Iraq, Oman Libya Bahrain	Arab Institute for Training and Research in Statistics (Baghdad)
National Courses in Fishery Statistics	Monrovia (Liberia)	2 weeks Feb/March 1979	Statistical collection for industrial and artisanal fisheries; catch assessment surveys	Intermediate	E	20	Liberia	RAFR
Advanced Course in Fishery Statistics	Baghdad (Iraq)	1 week April/May 1979	Sampling design for large-scale statistical surveys (inland, marine); survey system for large-scale frame surveys (aerial and other methods)	University	E (Arabic)	17	Various Arab countries	Arab Institute for Training and Research in Statistics (Baghdad)

[a/] Communauté économique de l'Afrique de l'Ouest

Part I (cont.)

Title	Location	Duration	Subjects covered	Level	Lang.	No. of participants	Invited countries/ regions	Funding
II. FISHERY BIOLOGY								
Training Course in the Methodology of Fisheries Science (Biology)	Tegal (Indonesia)	4 weeks Oct/Nov 1978	Fishery biology (contents of the Holden/Raitt manual)	Post-university, university	E	33	South China Sea plus Papua New Guinea and Burma	DANIDA
Training Course in the Methodology of Fisheries Science (Biology)	Mombasa (Kenya)	4 weeks May/June 1980	Fishery biology (above manual and lecture notes prepared by D. Pauly)	Post-university, university	E	26	Northern and Western Indian Ocean	DANIDA
III. RESOURCE EVALUATION (SURVEYS & ACOUSTICS)								
Workshop on Marine Fisheries Resources Surveys	Jakarta (Indonesia)	2 weeks April 1975	Survey design and planning	Post-university	E	25	Indonesia	UNDP (IOP) + local
Training Course in Acoustic Methods for Fish Detection and Abundance Estimation	Manila (Philippines)	3 weeks November 1975	Acoustic survey techniques (echo integrator), acoustics manual	Post-university	E	25	South China Sea	Norway
Seminar on Fishery Resource Evaluation	Casablanca (Morocco)	4 weeks March 1978	Surveys design and planning; models for resource evaluation; use of survey data in stock assessment	Post-university	E F	27	CECAF member countries	CIDA

Part I (cont.)

Title	Location	Duration	Subjects covered	Level	Lang.	No. of participants	Invited countries/ regions	Funding
III. RESOURCE EVALUATION (SURVEYS & ACOUSTICS) (cont.)								
Training Course on Acoustic Survey Methods	Havana (Cuba)	3 weeks April/May 1978	Acoustic survey techniques, acoustic manual	Post-university	S	20	Cuba	UNDP
Training Course on Acoustic Methods for Fish Detection and Abundance Estimation	Casablanca (Morocco)	3 weeks June/July 1978	Acoustic survey techniques (echo integrator), acoustics manual	Post-university	E F	28	Africa	Norway
Regional Training Course in Electro-Acoustic Survey Methods for Assessment & Monitoring of Fishery Resources	Lima (Peru)	5 weeks Sept/Oct 1976	Acoustic survey techniques (echo integrator), acoustics manual	Post-university	S	27	Latin America	Norway
Training Course in Hydro-Acoustic Equipment for Fisheries Research	Lima (Peru)	3 weeks August 1978	Acoustic equipment for fisheries research	Electronic engineers and technicians	S	17	Latin America	Norway
Training Course on Acoustic Survey Methods	Bangkok (Thailand)	1 week November 1979	Acoustic survey techniques and planning	Post-university	E	32	South China Sea	UNDP

Part I (cont.)

Title	Location	Duration	Subjects covered	Level	Lang.	No. of participants	Invited countries/ regions	Funding
IV. RESOURCE EVALUATION (STOCK ASSESSMENT)								
Second Stage de formation FAO/CNEXO sur les méthodes d'évaluation des stocks halieutiques	Brest (France)	5 weeks August 1976	Estimation population parameters, assessment models, fishery management	Post-university	F	32	15 countries from Mediterranean and West Africa	French Trust Fund
Seminar on Fishery Development Planning and Management	Lomê (Togo)	3 weeks February 1978	Biological basis of management, objectives of management/development (+ fishery development planning)	University and Post-university	E F	28	Coastal countries of CECAF	Canadian Trust Fund
Seminar on Fishery Resources Evaluation	Casablanca (Morocco)	3 weeks March 1978	Stock assessment models, designing of surveys, data interpretation and biomass/ potential relationship, management	Post-university	E F	28	13 coastal countries of CECAF	Canadian Trust Fund
Seminar on the Management of Tropical Demersal Fisheries	Bangkok (Thailand)	2 weeks Oct/Nov 1979	Assessment, monitoring and management of tropical demersal fisheries	Post-university	E	30	Member nations of SCS Programme and 2 FAO member nations in Central East Africa + special participants	DANIDA

Part I (cont.)

Title	Location	Duration	Subjects covered	Level	Lang.	No. of participants	Invited countries/ regions	Funding
IV. RESOURCE EVALUATION (STOCK ASSESSMENT) (cont.)								
Training Course in Stock Assessment	Havana (Cuba)	4 weeks April 1979	Estimation population parameters, assessment models, fishery management	Post-university	S	20	Cuba	UNDP
Training Course on Marine Resources Evaluation	Shanghai (China)	4 weeks 1980	Estimation of population parameters, stock assessment biomass surveys, fishery management	Post-university	Chinese and E	30	China	UNDP
Training Course on the Methods of Stock Assessment	Manila? (Philippines)	5 weeks 1981	Estimation population parameters, assessment models, fishery management	Post-university	E	30	Western Central Pacific and Eastern Indian Ocean	DANIDA (pipeline)
Training Course on the Methods of Stock Assessment	Mahé (Seychelles)	1981	Estimation population parameters, assessment models, fishery management	Post-university	E	30	Western and Northern Indian Ocean	DANIDA (pipeline)
V. POLLUTION								
Third FAO/SIDA Training Course on Aquatic Pollution in Relation to Protection of Living Resources	Lima (Peru)	6 weeks Feb/March 1975	Various kinds of contaminants, limnology, sedimentology, sampling and analysis, case studies, monitoring programme, national and international legislation and cooperation	Government administrators/ biologists	S	21	Latin America	SIDA

Part I (cont.)

Title	Location	Duration	Subjects covered	Level	Lang.	No. of participants	Invited countries/ regions	Funding
V. POLLUTION (cont.)								
Fourth FAO/SIDA Training Course on Aquatic Pollution in Relation to Protection of Living Resources	Lysekil (Sweden)	6 weeks Oct/Nov 1975	Bioassays and toxicity testing techniques, sources and effects of pollutants	Scientists/ biologists	E	17	Latin America, Africa, Asia, Near East	SIDA
Fifth FAO/SIDA Workshop on Aquatic Pollution in Relation to Protection of Living Resources	Manila (Philippines)	6 weeks Jan/Feb 1977	Scientific and administrative basis for management measures in aquatic pollution control	Government administrators/ biologists	E	25	Asia and Far East, Brunei, Singapore, Western Samoa	SIDA
Sixth FAO/SIDA Workshop on Aquatic Pollution in Relation to Protection of Living Resources	Nairobi and Mombasa (Kenya)	6 weeks June/July 1978	Scientific and administrative basis for management measures in aquatic pollution control	Government administrators/ biologists	E	26	Africa (English speaking), Mozambique, Seychelles	SIDA
Seventh FAO/SIDA Workshop on Aquatic Pollution in Relation to protection of Living Resources	Manila (Philippines)	5 weeks May/June 1979	Analysis of metals and organochlorines in biota	Scientists (analytical chemists)	E	24	Asia and Far East, South West Pacific (English speaking)	SIDA
VI. AQUACULTURE								
Freshwater Aquaculture Training	Kwangtung Province (P.R. China)	9 months April/Dec 1978	Freshwater aquaculture	Technical and supervisory	E	44	Bangladesh	TCP (FAO)

Part I (cont.)

Title	Location	Duration	Subjects covered	Level	Lang.	No. of participants	Invited countries/ regions	Funding
VI. AQUACULTURE (cont.)								
Training Course in Fish Feed Technology	Seattle (USA)	6 weeks Oct/Dec 1978	Feed ingredients, feed formulation, nutritional biochemistry, feed milling technology, practical diets, quality control	Technical and supervisory	E	16	Asia and Africa	UNDP
Freshwater Aquaculture Training	Seattle (USA)	9 months April/Dec 1979	Freshwater aquaculture	Technical and supervisory	E	40	Asia	UNDP

PART II: LIST OF FAO MANUALS ON FISHERY RESOURCE SCIENCE

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Brander, K., 1975 Guidelines for collection and compilation of fishery statistics. FAO Fish. Tech.Pap., (148):46 p. (E)

Gulland, J.A., 1966 Manual of sampling and statistical methods for fisheries biology. Part 1. Sampling methods. FAO Man.Fish.Sci., (3):87 p. (E,F,S) (Priced)

2. FISHERY BIOLOGY

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Holden, M.J. and D.F.S. Raitt (eds.), 1974 Manual of fishery science. Part 2. Methods of resource investigations and their application. FAO Fish.Tech.Pap., (115)Rev.1: 214 p. (E,F,S)

Kesteven, G.L., 1973 Manual of fishery science. Part 1. An introduction to fishery science. FAO Fish.Tech.Pap., (118):43 p. (E,F,S)

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Beverton, R.J.H. and S.J. Holt, Manual of methods for fish stock assessment. Part 2.
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5. INLAND WATERS

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6. POLLUTION

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1976 analyses of biological material (Guidelines for the FAO (GFCM)/UNEP Joint Coordinated Project on Pollution in the Mediterranean). *FAO Fish.Tech.Pap.*, (158):124 p. (E,F)

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PART III: SUMMARY REVIEW OF TRAINING/RESEARCH ACTIVITIES CONDUCTED UNDER FAO FISHERY BODIES

1. GFCM (GENERAL FISHERY COUNCIL FOR THE MEDITERRANEAN)

1.1 Working Party on Resource Appraisal and Fishery Statistics

Actual membership: one biologist - plus, for a few countries, one statistician - from 15 countries out of 19 members of GFCM; members nominated by their governments.

Frequency of meetings: every other year, plus *ad hoc* sub-regional meetings, e.g. on the assessment of the Black Sea turbot (June 1979), on the assessment of fish stocks in statistical divisions Gulf of Lion and Balearic (October 1979).

Scope of activities: stock assessment; strengthening of national statistical systems; promotion of national action for fishery management.

Past and future performance: This Working Party, complemented by training centres in fishery biology and resources evaluation (e.g. the two FAO/CNEXO Training Courses on Stock Assessment (1973, 1986)), has been a key instrument for the transfer of basic methodology for stock assessment in most Mediterranean countries. For several of its member countries, the periodic sessions represent the main opportunity they have to confront their results, learn about new of alternative methods of interpreting their data or alternative approaches to monitor and assess their resources (e.g. surveys). It has also helped in reducing the lack of communications between research and administration.

In the long run, progress will probably be slow because of the insufficiencies in the institutional structure and, in general, the scattered nature of the fishing activities and the limited importance of fisheries in most national economies - factors which do not facilitate investigations of the Mediterranean fisheries.

1.2 Working Party on Marine Pollution in Relation to the Protection of Living Resources

Actual membership (1974): selected pollution experts from Egypt, France, Greece, Italy, Romania, Spain and Yugoslavia

Frequency of meetings: an *ad hoc* meeting and two meetings were held in December 1969 and in January and September 1974 respectively. No other meeting is planned before the termination of the Joint FAO(GFCM)/UNEP Coordinated Project on Pollution in the Mediterranean.

Scope of activities: to assess, through the cooperation of the institutes and laboratories of the Mediterranean, the amount of heavy metals and pesticides in the marine species of commercial importance; to promote biological, ecological and biochemical studies directed to identifying the sources of pollution of any nature related to the protection of living resources; and to collect, store and disseminate data relating to pollution and its effects on living resources

Past and future performance: The immediate result of the activities of the Working Party was the preparation of the first comprehensive survey on the state of pollution in the Mediterranean which was published in 1972 under the title "The State of Marine Pollution in the Mediterranean and Legislative Controls" (GFCM Studies and Reviews No. 51). As a second step in implementing the recommendations of the Working Party - endorsed by the

GFCM itself at its Eleventh Session - a Consultation was convened in Rome in 1974 to study the protection of living resources and fisheries from pollution in the Mediterranean. The guidelines which were adopted by the Consultation were later on used by UNEP to prepare its Action Plan for the Protection and Development of the Mediterranean Region; this plan was adopted in Barcelona in 1975.

The Action Plan is presently under implementation - with an active part played by the GFCM within the framework of the Joint FAO(GFCM)/UNEP Coordinated Project on Pollution in the Mediterranean - and the activities of the Working Party will be resumed after the completion of the joint project when guidance for member States will again be necessary.

1.3 Working Party on Acoustic Methods for Fish Detection and Abundance Estimation

Actual membership: open to all Members of the GFCM. To date, 12 countries, out of 19, have nominated members.

Frequency of meetings: the first session was held in Ancona, Italy, in November 1979. Further sessions will be convened as and when necessary.

Scope of activities: to keep under review the state of development in the fields of acoustic fish detection, available equipment, operational techniques and their application for fish abundance estimation studies; to coordinate studies and to compare the results of resource evaluation through different methods; and to facilitate collaboration among countries and within existing mechanisms (ACMRR *ad hoc* Group of Experts on the Facilitation of Acoustic Research in Fisheries, in particular).

Past and future performance: Not applicable at this stage.

1.4 Cooperative Programme of Research on Aquaculture (COPRAQ)

Actual membership: open to all research institutions in the Mediterranean working on marine aquaculture. At present, about 30 institutions from 11 countries participate in the programme.

Frequency of meetings: in theory every second year. However, due to insufficient financial and secretarial means, this periodicity of meetings could not be met. The two last sessions of COPRAQ took place in 1975 and October 1979.

Scope of activities: COPRAQ is intended to be a forum where Mediterranean marine aquaculture research workers can discuss and compare their plans and achievements regarding controlled and induced breeding and intensive culture of commercially important species of finfish, crustaceans and molluscs. This, of course, involves problems such as mass production of juveniles and larvae rearing. However, if sufficient financial means were given to it, COPRAQ could also become an organism through which joint studies on specific aspects of marine aquaculture development could be carried out in the Mediterranean

Other related activities: the Regional Mediterranean Aquaculture Project which, in its first stage, will involve countries from the Mediterranean itself and, in the second, is expected to also get participation from the Black Sea Coastal States, intends to rely on COPRAQ as an advisory body for scientific and technical problems of marine aquaculture in the region.

Past and future performance: Although since its establishment in 1970 COPRAQ was considered by the GFCM countries as a basic tool for the purposes of aquaculture development in the Mediterranean, its activities have been hampered by financial difficulties and also by the difficulties met by the Fisheries Department to provide full technical backstopping. The Regional Mediterranean Aquaculture Project, which intends to rely on COPRAQ for scientific and technical advice, will - it is expected - give COPRAQ a part of the assistance it needs to carry out the tasks for which it was established.

2. CECAF (FAO FISHERY COMMITTEE FOR THE EASTERN CENTRAL ATLANTIC)

2.1 Working Party on Resource Evaluation

Actual membership:	one biologist nominated as National Correspondant, by 14 countries out of 30 members of CECAF.
Frequency of meetings:	every two years of the formal Working Party, and several *ad hoc* ones organized by the CECAF Project (see under related activities below).
Scope of activities:	stock assessment; strengthening of national and regional statistical systems; promoting national actionsfor fishery management.
Other related activities:	in 1978 and 1979 the CECAF Project organized a dozen *ad hoc* working parties where most of the information available on the fish resources in the CECAF area were compiled and interpreted, the various fish stocks of the region were thoroughly assessed, and problems of methodology (e.g. age determination for sardine, measurement of fishing effort in pelagic fisheries, etc.) were discussed. The stocks covered include the Moroccan sardine (2 meetings), the coastal pelagic stocks in the northern and southern parts of CECAF (2 meetings) and in the Ghana-Ivory Coast sector (1 meeting), the hake stocks (1 meeting), the cephalopods in the northern part of CECAF (1 meeting), the demersal stocks in the northern part (2 meetings) and the southern part (1 meeting) of CECAF, and the Penaeid shrimp stocks (2 meetings). These activities have led to an exhaustive review of the information available on the fish resources in the region and their potentials. Recommendations for future research and management were also made. Participation included experts from the region, including junior scientists for whom attendance provided good training, as well as scientists from non-coastal countries which are, or have been, active in the exploitation and research of relevant fish stocks.

Past and future performance: The concerted activities conducted by the CECAF Committee and Project, complemented by the training courses on resources evaluation organized by FAO in recent years, have provided ample opportunities to train local scientists in basic methods for stock assessment, with emphasis on approaches best adapted to local fish resources and fisheries as well as research conditions. A new training course in English is needed. The major constraint upon better scientific skill does not primarily lie in insufficient training, but rather in unsatisfactory research facilities/environment/structure. This is demonstrated by the high loss of trained scientists. With the exception of a few countries such as Morocco, most do not have the economic means to acquire and maintain the critical research mass (e.g. some ten experienced scientists plus one computer plus one research survey vessel). Pooling of national resources would help to overcome such limitations and would be desirable to cover the many and abundant shared stocks occurring in the northern part of CECAF. Progress in building up research capabilities is still hampered by outside factors. For example, countries in the region are still involved in the primary stage of building themselves up as nations, with an efficient central administration, internationally accepted national boundaries, etc. Development of research capabilities can only come after other priorities, like self-sufficiency in education at primary, then secondary and finally university levels, have been satisfied. Although substantial differences are observed among countries, heavy equipment (computer, research vessels) and the technical manpower needed to utilize it are drastically lacking.

Research conducted by non-coastal countries is decreasing - apparently in relation to the change in the Law of the Sea - with one exception, i.e. the investigations conducted for the last 25 years by ORSTOM (French) teams in Senegal, Ivory Coast and Congo.

3a. INDO-PACIFIC FISHERIES COMMISSION (IPFC) (MARINE)

3a.1. Subsidiary bodies

IPFC's main subsidiary body concerned with research - the Standing Committee on Resources Research and Development - was only established in 1976, and held its first meeting in March 1978 in Manila. Each member country of IPFC can nominate an expert as a member. Present membership is 15 countries.

Scientific work is also carried out by a number of working parties of experts nominated by FAO (who normally also pay the cost of attendance at meetings). These are:

(i) IPFC/IOFC Joint Working Party of Experts on Indian Ocean and Western Pacific Statistics. Established in 1969, this has held five meetings, most recently in March 1978.

(ii) Working Party on Aquaculture and Environment. Established in 1972, this has held four meetings, concentrating on aquaculture or environment at alternate meetings. Most recently met (to discuss aquaculture) in Manila, March 1978.

(iii) Working Party of Experts on Inland Fisheries. Established in 1976, this has met once, in Bangkok, in January 1978.

(iv) Working Party of Experts on Central and Western Pacific Skipjack. Established in 1976, this has met once, in Manila, in March 1978.

3a.2. Other working parties or similar groups

Several *ad hoc* working parties have been organized by the FAO/UNDP South China Sea Project to review information on the state of selected national or regional resources. The resources reviewed include:

(i) Malacca Straits (Jakarta, March/April 1976)

(ii) Visayan and Sibayan areas of the Philippines (Iloilo, October 1976)

(iii) Sulu Sea and Moro Gulf areas of the Philippines (Manila, April 1977)

(iv) Demersal resources of the Sunda Shelf (Penang, November 1977)

(v) Mackerels and round scads (Penang, November 1977)

(vi) Pacific coast of the Philippines (Manila, September 1978)

(vii) Demersal and pelagic resources of the Java Sea (Semarang, Indonesia, December 1978)

(viii) Tuna resources of Indonesia and the Philippines (Jakarta, March 1979)

(ix) North Luzon and western coasts of Luzon, Philippines (Manila, April 1979)

The participation varied but was generally 10-20 national scientists with support of one to four outside experts (staff of the South China Sea Programme, FAO Headquarters, or consultants hired by SCSP).

3a.3. Scientific studies

Discussion of scientific subjects, and the compilation of data and preparation of original studies has been mainly carried out by the working parties noted in 3a.2. These have, in general, been successful in bringing together a lot of statistical and biological data available in the countries, and to produce much better reviews of the knowledge of the resources concerned, and their state of exploitation, than were previously available. Several of the countries involved are very large, and much data relevant to resource evaluation (e.g. detailed statistics) has been buried in local or provincial records. An important feature of several workshops has been to disinter these data, and to get local people more closely involved in national research studies.

A special feature of IPFC has been the tradition of holding, at each biennial meeting, a symposium (usually of three days) on some special subject, usually of scientific interest (demersal resources, inland fisheries, etc.). These symposia and the volumes of collected papers, have contained some significant advances in fishery science in the region. They, and also the framework of subsidiary bodies, have helped establish through IPFC good contacts and mutual understanding between the scientists of the region, but this has not resulted in quite such a degree of close collaboration, and planning of joint activities as has occurred in some other regions. This was one of the reasons for establishing SCORRAD, but it is too early to see how effective this Committee will be.

3a.4. Training and improvement of scientific capacities

Most of the member countries have at least moderately-sized fishery research institutes, as well as good universities, often with substantial programmesin marine research. There is therefore less need than in some other areas for additional basic training, but a definite need for assistance to enable those with a general scientific education (possibly including training at a foreign university) to use this to do scientific work relevant to national fishery problems. It is believed that FAO regional activities, and particularly the workshops listed in 3a.2, have been effective in this.

3b. INDO-PACIFIC FISHERIES COMMISSION (IPFC) (INLAND)

3b.1. Standing Committee on Resources Research and Development (SCORRAD)

Establishment:	November 1976
Sessions:	First session March 1978. Second session was held in December 1979.
Membership:	Open to all Member Nations of IPFC.
Terms of reference:	The Committee shall advise IPFC on scientific matters, relating to the development and rational utilization of the fish resources in the Indo-Pacific Region. In particular, it shall:

(a) advise on the state of resources and of the fisheries based on them;

(b) encourage research, in the fields of biology, technology, socio-economics, and related disciplines;

(c) encourage the improvement of national statistics in the region.

Past and future performance: (See 3a.3)

3b.2. Working Party on Aquaculture and Environment

Establishment: October 1972

Sessions: Four sessions were held since 1972. The fifth session was held in Jakarta, Indonesia, in January 1980

Membership: Experts from India, Indonesia, Korea (Republic of), Malaysia, Nepal, Philippines, United Kingdom (Hong Kong) (as of 1978).

Terms of reference: The terms of reference were originally proposed by the Working Party at its first session, 14-17 October 1972, Wellington, New Zealand, and approved by the Commission at its fifteenth session, 18-27 October 1972, Wellington, New Zealand. They were subsequently enlarged to include item (e) below of the former IPFC Working Party on Economics of Aquaculture.

(a) to coordinate the FAO/IPFC Cooperative Research Programme on Aquaculture;

(b) to assist in the collection and dissemination of information on aquaculture research;

(c) to promote and assist in the studies of the effect of aquatic pollution on aquaculture;

(d) to promote and coordinate the survey of existing aquaculture and the potential for future development;

(e) to promote and coordinate studies of the economics of aquaculture covering the levels of the cost benefit ratios and investment in different types of aquaculture in comparison with alternative uses of land and water; and the economics of different culture practices in relation to the most efficient utilization of capital investment.

Past and future performance: In the past, the Working Party has devoted itself to the consideration of a wide variety of topics, including aspects of rearing fish, but more recently has been concerned with pollution and developing regional activities in integrated farming with emphasis on small farmers and rural aquaculture. The future activities of the Working Party depend on a decision to be taken during the forthcoming IPFC session and will be determined largely by the joint development of a number of programmes on aquaculture in the region.

3b.3. Working Party of Experts on Inland Fisheries

Establishment: November 1976

Sessions: First session in January 1978

Membership: Experts from Bangladesh, India, Indonesia, Malaysia, Philippines, Thailand, USA (as of 1978)

Terms of reference: (a) To advise on the state of inland fishery resources in the IPFC Region and to identify needs for international action leading to their better development and management;

(b) To encourage and outline lines of approach to common research programmes on inland fishery biology and ecology to lead to better development, management and conservation of the resources;

(c) To identify problems of inland fishery statistics, technology and aquaculture-related aspects of inland fishery management and liaise with the appropriate working party through SCORRAD as to the best means of accomplishing work in these fields.

Past and future performances: The Working Party has met once to formulate short and medium-term programmes. Following recommendations of the first meetings, activities have been undertaken under the Regular Programme (preparation of a manual) and by Correspondence groups (preparation of a technical paper). Further work by the Working Party has been hampered by lack of funds, although a training course for fisheries managers will be held under its auspices in the coming biennium. The future activities of the Working Party will be reviewed by SCORRAD and the forthcoming IPFC session.

4. INDIAN OCEAN FISHERY COMMISSION (IOFC)

4.1 Subsidiary bodies

The Committee on Management of Indian Ocean Tuna, established in 1968, held its first meeting in 1970 in Rome. All subsequent meetings were joint meetings with the IPFC Special Committee on Management of the Indo-Pacific Tuna. Only three of the ten member countries are exclusively members of the IOFC Committee. Four member countries are not bordering the Indian Ocean.

Scientific work on tunas and shrimp is carried out by two working parties:

(a) The Ad Hoc Working Party of Scientists on Stock Assessment of Tuna, established in 1968 initially under a different name (IOFC Working Party on Stock Assessment in Relation to Immediate Problems of Management in the Indian Ocean). After a first session in Rome in 1969 the Ad Hoc Working Party of IOFC has met jointly with the similar IPFC Ad Hoc Working Party in 1972 and 1974

(b) A Special Working Party on Stock Assessment of Shrimp in the Indian Ocean Area, established in 1970, had one session in 1971 in Manama, Bahrain, reviewing shrimp resources of a large part of the Indian Ocean, while an Ad Hoc Group of the Special Working Party met in 1976 in Doha, Qatar, to consider the shrimp resources of the Gulf between Iran and the Arabian Peninsula.

4.2 Inter-regional and regional projects

Fisheries development work and fisheries research and statistics in the Indian Ocean has been coordinated since 1970 by the International Indian Ocean Fishery Survey and Development Project (IOP). This project is supervised by an IOFC Executive Committee, established in 1970, which held its eighth and last session in April 1979 in Rome, and supported by UNDP. The project has stimulated the execution of two large regional resource survey programmes, each followed by a meeting of scientists to discuss the results of these investigations.

The resource surveys conducted in the Indian Ocean can be summarized as follows:

(a) The R/V DR FRIDTJOF NANSEN surveyed the coasts of the Arabian Sea between the India/Pakistan border and Mombasa, Kenya, in the period February 1975-December 1976. Scientists from the coastal states participated in the cruises. The results were discussed in the:

FAO/Norway Workshop on the Fishery Resources of the North Arabian Sea held in Karachi, Pakistan, 16-28 January 1978, with 24 participants from the area (scientists and administrators), 4 observers and 9 FAO staff members.

(b) The R/V PROF MESYATSEV surveyed the southwestern Indian Ocean between December 1975 and December 1977; 29 local scientists participated in the survey programme. Results of the survey and statistics collected by the coastal states were discussed at the:

FAO/IOP Workshop on the Fishery Resources of the Western Indian Ocean, South of the Equator, Mahé, Seychelles, 23 October-4 November 1978. This workshop was attended by 17 scientists and fisheries administrators from the area, 3 observers and 5 FAO staff members.

The two workshops were successful in pointing out the need for further exchange of information and cooperation in fisheries research and training in these two regions.

(c) A third large-scale survey, the Joint Eastern Tropical Indian Ocean Fishery Survey (JETINDOFISH) has just started to cover the Indonesian part of the Indian Ocean and South West Australia. The survey, coordinated by IOP from Benoa, Bali, operates three vessels, the R/V COURAGEOUS (Australia), BAWAL PUTIH II (Indonesia) and the JURONG (German/Indonesian project). The surveys are to be supplemented by further work on fishery statistics and investigations in inshore waters. Training of scientists and exchange of information, in particular between Australia and Indonesia, form part of the programme.

Although IOP has succeeded in setting up a regional project for the Bay of Bengal (FAO/SIDA Project for the Development of Small-Scale Fisheries in the Bay of Bengal), it was found difficult to set up a regional resource survey. This project, although not having a fisheries scientist or statistician, will be organizing one or more workshops on resources in the Bay of Bengal, starting in 1980. These workshops will probably make use of the results of national resource surveys to be carried out by Dr FRIDTJOF NANSEN and other vessels.

In general, training of, and exchange of information among, fisheries scientists in the Indian Ocean area has only just begun. As a result of the presently considered decentralization of the activities of the Indian Ocean Programme, it will be possible to discuss common stocks and problems easier and more often than has hitherto been the case.

(d) Another major survey programme has just been terminated in the Gulf of Oman and the Gulf lying between Iran and the Arabian Peninsula by the Regional Fishery Survey and Development Project, financed by a Trust Fund and UNDP and coordinated by a sub-committee of the Committee for Development and Management of the Fishery Resources of the Gulfs. The few local scientists have been involved in this work which needs a follow-up in the form of training and improvement of statistics.

(e) The Red Sea is covered by a relatively new project, the Development of Fisheries in Areas of the Red Sea and Gulf of Aden. Sampling programmes are being set up in several countries through local scientists and it is the intention to bring the scientists together in regional training courses organized by the project.

4.3 Scientific capacity and fisheries research institutes

Most countries in the IOFC area have one or more fishery research institutes and some have also elaborate systems for statistical data collection. However, in many cases, the scientists are oriented to do marine biological studies on usually easily accessible species rather than applied fisheries biology and stock assessment. Survey work is usually condidered to be important, but there is often a lack of clear objectives and processing of the data collected is often delayed.

Two large research facilities, the EAMFRO at Zanzibar and the Centre national de recherches océanographiques (CNRO) at Nosy Bé, Madagascar, have become largely inactive due respectively to the breaking up of the East African community and the withdrawal of French scientists (ORSTOM) from Madagascar.

Many countries are in the process of setting up, or improving, their fisheries research institutes (e.g. Tanzania, Mozambique, Madagascar, Kenya, Somalia, People's Democratic Republic of Yemen (PDRY), Oman, Iran, Burma). They do this either directly or through FAO, UNESCO or ALECSO (Arab League Cultural and Scientific Organization).

The curriculae of some universities are being modified to train fisheries and other marine scientists (Somalia, PDRY).

There is a need for FAO assistance in training of scientists in typical fisheries specializations, such as stock assessment, acoustic surveys, fishery statistics, etc.

5. WESTERN CENTRAL ATLANTIC FISHERY COMMISSION (WECAFC)

5.1 Subsidiary body

The Commission is served by an international project for the development of fisheries in the western central Atlantic (the WECAF Project). The project was implemented in 1977 with offices in Panama, and membership open to all nations bordering the Gulf of Mexico - Caribbean Sea region. Present membership is 27 countries. The project has several functions including on-sight fishery survey and experimental fishing; advice on fishery sampling and data compilation; resource evlauation; and training in all these areas of activity.

5.2 Working Party meetings

WECAFC convened a joint meeting of the Working Party on Assessment of Fish Resources and the Working Party on Stock Assessment of Shrimp Lobster Resources in Cartagena, Colombia, from 18-23 November 1977, from which a report is available (FAO Fisheries Report No. 211). This joint Working Party is to convene again in November 1979. The two Working Parties were established at thefirst WECAFC Meeting in October 1975.

Before the establishment of the Commission, two consultations were organized on shrimp in the CICAR area, the first in June 1972 in Havana, Cuba, and the second in December 1974 in Caracas, Venezuela.

5.3 Other institutes

Yearly meetings of scientists from the Gulf of Mexico and the Caribbean are organized by the Gulf and Caribbean Fisheries Institute in Miami.

Several internationally-oriented facilities for training of marine scientists exist in the area, e.g. at Curaçao (CARMABI), Bimini (Bahamas), and Miami, Houston (USA) to name a few.

6. EIFAC (EUROPEAN INLAND FISHERIES ADVISORY COMMISSION)

6.1 EIFAC Working Party on Water Quality Criteria

Establishment:	1962
Sessions:	Nineteen sessions were held so far. The 20th session will be held in November 1981.
Membership:	Experts appointed by the Director-General of FAO in their personal capacity. Composition changed according to the subjects being studied.

Terms of reference: To establish water quality criteria for European freshwater fish.

Past and future performance: The Working Party has prepared reviews of literature and recommended water quality criteria for finely divided solids, extreme pH values, water temperature, ammonia, phenols, dissolved oxygen, chlorine, zinc, copper and cadmium. In addition it prepared a report on fish toxicity procedures. All these reports have recently been updated and are being published in book form in English and French.

At its next meeting, the Working Party will consider the complex problem of mixtures of poisons in relation to water quality criteria for freshwater fish.

6.2 EIFAC Cooperative Programme of Research on Aquaculture (COPRAQ) - Fish Diseases

Establishment: 1972

Sessions: Two sessions were held in 1975 and 1977 respectively. The third session was held in October 1979.

Membership: Institutes engaged in fish diseases research.

Terms of reference: To develop a cooperative programme of research between European institutions and others as required on fish diseases. The following diseases were included in this programme:

(a) Viral diseases: Viral Haemorrhagic Septicaemia (VHS) of trout, Infections Pancreatic Necrosis of Salmonidae (IPN) and Spring Viraemia of Carp (SVC).

(b) Bacterial diseases: Furonculosis, Vibriosis and Erythrodermatitis.

(c) Parasitic disease: Myxosomosis.

Past and future performance: The second meeting of COPRAQ - Fish Diseases, brought together representatives from 30 fishery research institutions in Europe and one from Canada. Forty-three papers on the subject of the programme were presented and the following lines of research were selected for the next two years:

(a) the host-pathogenic agent relationship in the diseases already included in the programme, with emphasis on detecting the general and local mechanisms responsible for protection;

(b) the transmission of these diseases, with emphasis on the mechanisms by which the pathogenic agents penetrate into the body;

(c) application of operational research methodology to fish pathology model.

For the third session of COPRAQ - Fish Diseases, already 45 papers have been promised and it is expected that the meeting will bring together 60 fishery scientists from Europe, Canada, USA and Japan.

6.3 EIFAC Working Party on the Economic and Technical Appraisal of Different Types of Fish Culture

Establishment: 1968

Sessions: Four sessions were held (1972, 1974, 1976 and 1978). A fifth session was held in 1980 in conjunction with the eleventh session of EIFAC.

Membership: Experts appointed in their personal capacity.

Terms of reference:
(a) to assess the costs of producing fish by culture operations;
(b) to evaluate the return on investments;
(c) to make intranational and international comparisons of economic results of fish culture operations under varying conditions;
(d) to increase the efficiency of existing fish farms and help to promote the establishment of new farms.

Past and future performance: The Working Party had great difficulties to accomplish its task because of lack of detailed and meaningful information from fish culture establishments. At its fourth session it was in fact recommended that EIFAC activities be strengthened through the appointment of a specialist in the economics of aquaculture. At the fifth session of the Working Party a draft working document on the main problems of fish culture economics will be discussed.

7. CIFA (COMMITTEE FOR INLAND FISHERIES OF AFRICA)

7.1 CIFA Working Party on River and Floodplain Fisheries

Establishment: 1975

Sessions: The first session of this Working Party will be organized in the form of a workshop on river and floodplain fisheries.

Membership: Experts selected by the Director-General of FAO in their personal capacity.

Terms of reference:
(a) to assemble and interpret existing data on the morphology, hydrology, ecology and fisheries of the rivers and floodplains of Africa;
(b) to assemble data on plans and proposals for development of river basins and identify possible effects of such developments on the river and floodplain fisheries;
(c) to develop methods for the rapid assessment of stocks and rivers and floodplains, to identify techniques for the management of their fisheries and to advise member governments on programmes and objectives for research on these topics;
(d) to prepare a project idea for a regional study and development of floodplains and river fisheries;
(e) to formulate the prospectus for a seminar or symposium on river and floodplains fisheries to be held in conjunction with the third session of CIFA;
(f) to work in coordination with other groups interested in the various aspects of floodplain management.

Future performance: Earlier experience with CIFA brought out the fact that few fishery research experts can be found in the field of inland fisheries in Africa. Consequently, it was felt at the third session of CIFA (1977) that working parties were not the ideal system to implement the programme of the Committee. The systems of consultants and workshops were considered more appropriate.

The workshop will put emphasis on experience in Africa and concentrate on new information available for thepurpose of promoting understanding among the participants of the variety of problems encountered in the management of floodplain river fisheries. The workshop will give particular attention to cases of success and failure in floodplain fishery management and to losses to fish production through environmental alteration and the means through which these losses can be made up.

7.2 CIFA Working Party on Aquaculture

Establishment: 1972

Sessions: First session held in 1974. The second session was held in Nov.-Dec. 1979.

Membership: Experts selected by the Director-General of FAO in their personal capacity.

Terms of reference: To collect and disseminate information to government agencies and research workers on:

(i) aquaculture economics, with particular emphasis on the preparation of a practical accounting pamphlet and a well-designed questionnaire to survey pond fish culture operations in government-controlled farms;

(ii) the ecological impact of introduced exotic fish and shellfish;

(iii) specific cultural methods of important fish and shellfish species, with particular emphasis on low cost production systems involving the use of cages, enclosures, rice fields and organic wastes.

Past and future performance: The first session of the Working Party was responsible for the technical preparation of an African-wide symposium on aquaculture which was successfully held in Accra, Ghana, in 1975. The second session is being organized in the form of a workshop in close collaboration with the International Foundation for Science (IFS). The purpose of the workshop is to assemble a limited number of African technicians representing coastal countries highly interested in brackish water aquaculture of either fish or shrimps. The workshop will deal with coastal environment, cultured organisms, cultural systems and their technology and socio-economic aspects. A few consultants are being recruited in collaboration with the FAO Regional Office for Africa to emphasize the training character of the workshop.

7.3 CIFA Working Party on Stock Assessment

Establishment: 1972

Sessions: This Working Party meets at the time of CIFA sessions and carries out its work by correspondence.

Membership: Experts from member countries attending CIFA sessions.

Terms of reference: (a) to assemble experience of African workers in the use of various methods for the monitoring of the status of fish stocks;

(b) to ascertain the particular data needed to approximate the parameters of stock assessment in tropical inland waters, and their variability;

(c) to interpret these experiences and formulate recommendations for the selection of appropriate monitoring programmes for various types of fisheries;

(d) to suggest standardized reporting forms to assemble and disseminate the above data among African fishery institutions;

(e) to select priority areas for further research in stock assessment in African inland waters;

(f) to prepare technical documents related to the above work.

Past and future performance: This Working Party has met twice for seminars but most of its work carried out by correspondence. More recently the Working Party has been inactive due to lack of Headquarters support staff and to the higher priorities assigned to other working parties of the Committee. Meanwhile, new approaches to stock assessment and management are being developed and will form the subject of future activities of the Working Party.

7.4 CIFA Ad Hoc Sub-Committee for the Sahel

Establishment: 1975

Sessions: Sessions of this Committee were organized in close collaboration with the Interstate Committee for Drought Control in the Sahel (CILSS).

Membership: CIFA member countries that participate in the Regional Project (Regional Project for the Preparation of an Integrated Development Plan for Optimal Utilization of the Fishery Resources in the Inland Waters of the Sahelian Zone) and in the eventual long-term Integrated Development Plan, and that express the desire to be members; and at least one member of CIFA Executive Committee.

Terms of reference:

(a) to act for CIFA during the inter-sessional periods with respect to matters relating to the fisheries of the Sahelian Zone;

(b) to maintain close liaison with regional organizations concerned with the fisheries of the Sahelian Zone and CIFA;

(c) to provide guidance, as required, to the Regional Project for the Preparation of an Integrated Development Plan for the Optimal Utilization of the Fishery Resources in the Inland Waters of the Sahelian Zone and, eventually, to provide guidance to the long-term Integrated Development Plan;

(d) to report to CIFA, at each session, on its activities during the preceding inter-sessional period.

Past and future performance: In collaboration with CILSS and the Club of Sahel, an integrated development plan for the optimal utilization of the Sahelian fishery resources was prepared for the short and medium term. Future efforts will center on the identification of funds to implement first generation projects and the elaboration of future development plans. This will be done in close collaboration between FAO (FIO), CILSS and the Club of the Sahel.

7.5 CIFA Ad Hoc Sub-Committee for Lake Tanganyika

Establishment: 1977

Sessions: First session March 1978.

Membership: Burundi, Tanzania, Zaire, Zambia.

Terms of reference:

(a) to act for CIFA during the inter-sessional periods with respect to matters related to the fisheries of Lake Tanganyika;

(b) to develop a regional fishery project and bring it to the operational stage;

(c) to provide technical guidance to individual governments in the implementation of the regional project and ensure coordination of national projects in line with the regional objectives;

(d) to assist in seeking financial assistance for additional projects which could be an outcome of the regional project;

(e) to participate in the long-term integrated development of the fisheries in the area;

(f) to report to CIFA at each session on its activities during the preceding inter-sessional period.

Past and future performance: The first session made specific proposal for a regional fishery project. The second session should finalize the project of regional fishery resources research on Lake Tanganyika and obtain the agreement of the four countries concerned. FIO has an important input to make in the sub-committee.

8. COPESCAL (COMMISSION FOR INLAND FISHERIES OF LATIN AMERICA)

8.1 Working Party on Fishery Resources

Establishment: March 1979

Sessions: The first session was held in March 1981.

Membership: Not yet established.

Terms of reference: The Working Party shall facilitate the development and management of the inland fishery resources of Latin America by:

(a) advising member governments on methods for the assessment of their fish stocks including the collection and treatment of data;

(b) evaluating the impact on fisheries of man-made changes in the environment, and of the fisheries themselves;

(c) investigating methods whereby inland fisheries and aquaculture can be integrated into rural development programmes;

(d) initiating and following up cooperative research programmes by national institutions on specific resource related topics;

(e) promoting training in fields related to fishery resources.

Past and future performance: Too early to assess.

ANNEX 7

Summary of answers to questionnaire on the availability and usefulness of FAO manuals and related documents on fisheries resource research

by

the Secretariat
FAO, Rome, Italy

INTRODUCTION

As part of the activities of the workshop, a questionnaire was sent out in late 1979 to 66 selected scientists working in fisheries resource research in a wide range of developing countries to obtain their views on the availability and usefulness of FAO manuals and related documents on fisheries resource research. Sixty replies (91 percent) were received and the following tables and comments summarize the answers.

QUESTION 2: Geographical distribution of answers

Geographical area	Received	Valid	Remarks
Africa	23	23	including Mediterranean[1/] countries, Seychelles and Madagascar
Latin America	11	11	
Asia	22	21	including Cyprus, Turkey
Europe	4	4	Mediterranean countries[2/]
Oceania	0	0	
	60	59	

QUESTION 3: Experience (duration in years) of people having sent replies

	0/5	6/10	11/15	16/20	21/25	26/30
Africa	9	7	4	2	0	2
Latin America	0	5	3	2	1	0
Asia	2	4	4	5	3	2
Europe	0	1	0	1	2	0
Oceania	0	0	0	0	0	0
	11	17	11	10	6	4
Percentage	19	29	19	17	10	7

[1/] Algeria (2 replies), Egypt (2 replies), Morocco (4 replies), Tunisia (1 reply)

[2/] Bulgaria (2 replies), Spain (1 reply), Yugoslavia (1 reply)

QUESTION 4: Species groups of concern of people having sent replies

	Demersal	Pelagics	Demersal + Pelagics	Demersal + Invertebrates	Invertebrates	Others
Africa	7	5	6	2	3	0
Latin America	1	4	4	1	1	0
Asia	3	8	5	1	3	0
Europe	1	1	2	0	0	0
Oceania	0	0	0	0	0	0
Total	12	18	17	4	7	0

QUESTION 5: Field of activities

Almost all replies are from experts concerned with resource evaluation.

QUESTION 6: Usefulness of FAO Manuals and related documents

Part 1: see pages 3, 4 and 5

Part 2: Questions:

6.1 Which documents (of list given) are available in your Institute library?

6.2 Which documents, while not available in your Institute library, are available in another library in the same town?

6.3 Of which documents do you have a personal copy?

6.4 Which documents have you read?

6.5 Which documents have you consulted at least twice during 1979?

6.6 Which documents have you found particularly interesting or useful?

6.7 Are any of these documents on topics of importance to you too difficult to be useful?

QUESTION 6: Part 1 - List of manuals and similar documents on fishery resource science

Languages are indicated by the letters: E (English), F (French) and S (Spanish) at the end of each reference.

I. FISHERY STATISTICS

1. Bazigos, G.P., The design of fisheries statistical surveys - inland waters. FAO Fish.
1974 Tech.Pap., (133):122 p. (E,F,S)

2. ____________, Applied fishery statistics. FAO Fish.Tech.Pap., (135):164 p. (E,F,S,)
1974a

3. ____________, Applied fishery statistics: vectors and matrices. FAO Fish.Tech.Pap.,
1975 (135)Suppl.1:34 p. (E) (F and S in preparation)

4. ____________, The design of fisheries statistical surveys - inland waters. Populations
1976 in non-random order, sampling methods for echo-surveys, double sampling. FAO Fish.Tech.Pap., (133)Suppl.1:46 p. (E)

5. ____________, Mathematics for fishery statisticians. FAO Fish.Tech.Pap., (169):183 p.
1977 (E)

6. Brander, K., Guidelines for collection and compilation of fishery statistics. *FAO Fish.*
1975 *Tech.Pap.*, (148):46 p. (E)

7. Gulland, J.A., Manual of sampling and statistical methods for fisheries biology. Part 1.
1966 Sampling methods. *FAO Man.Fish.Sci.*, (3):87 p. (E,F,S) (priced)

II. FISHERY BIOLOGY

8. Everhart, W.H., A.W. Eipper and W.D. Young, Principles of fishery science. Ithaca,
1975 Comstock Publishing Associates, Cornell University Press, 288 p. Rev.ed. (E)

9. Holden, M.J. and D.F.S. Raitt (eds), Manual of fishery science. Part 2. Methods of
1974 resource investigations and their application. *FAO Fish.Tech.Pap.*,
(115)Rev.1:214 p. (E,F,S)

10. Kesteven, G.L., Manual of fishery science. Part 1. An introduction to fishery science.
1973 *FAO Fish.Tech.Pap.*, (118):43 p. (E,F,S)

11. Laevastu, T., Manual of methods in fisheries biology. *FAO Man.Fish.Sci.*, (1):10 fasc.
1967 (E,F,S)

12. Royce, W.F., Introduction to the fishery sciences. New York, Academic Press, 351 p.
1972 (E)

III. RESOURCE SURVEYS

13. Burczynski, J., Introduction to the use of sonar systems for estimating fish biomass.
1979 *FAO Fish.Tech.Pap.*, (191):89 p. (E)

14. Forbes, S.T. and O. Nakken (eds), Manual of methods for fisheries resource survey and
1972 appraisal. Part 2. The use of acoustic instruments for fish detection and
abundance estimation. *FAO Man.Fish.Sci.*, (5):138 p. (E,F,S) (priced)

15. Gulland, J.A., Manual of methods for fisheries resource survey and appraisal. Part 5.
1975 Objectives and basic methods. *FAO Fish.Tech.Pap.*, (145):29 p. (E)

16. Saville, A. (ed.), Survey methods of appraising fishery resources. *FAO Fish.Tech.Pap.*,
1977 (171):76 p. (E,F,S)

17. Smith, P.E. and S.L. Richardson, Standard techniques for pelagic fish egg and larva
1977 surveys. *FAO Fish.Tech.Pap.*, (175):100 p. (E)

18. Ulltang, O., Methods of measuring stock abundance other than by the use of commercial
1977 catch and effort data. *FAO Fish.Tech.Pap.*, (176):23 p. (E,F,S)

IV. STOCK ASSESSMENT AND FISHERY MANAGEMENT

19. Beverton, R.J.H. and S.J. Holt, On the dynamics of exploited fish populations. Fisheries
1957 Investigations UK. Ser.2, Vol.19:pp. 1-533 (E)

20. ____________, Manual of methods for fish stock assessment. Part 2. Tables of yield
1966 functions. *FAO Fish.Tech.Pap.*, (38)Rev.1:67 p. (E,F,S)

21. FAO, Monitoring of fish stock abundance: The use of catch and effort data. A report
1976 of the ACMRR Working Party on Fishing Effort and Monitoring of Fish Stock
Abundance. *FAO Fish.Tech.Pap.*, (155):101 p. (E)

22. ____________, Models for fish stock assessment. *FAO Fish.Circ.*, (701):122 p. (E,F)
1978

23. Gulland, J.A., 1969 Manual of methods for fish stock assessment. Part 1. Fish population analysis. FAO Man.Fish.Sci., (4):154 p. (E,F,S) (priced)

24. ____________, 1974 Guidelines for fishery management. Indian Ocean Programme. IOFC/DEV/74/36:84 p. (E) (Summary in F)

25. ____________, 1974a The management of marine fisheries. Bristol. Scientechnica, 198 p. (E)

26. Gulland, J.A. (ed.), 1977 Fish population dynamics. New York, Wiley-Interscience, 372 p. (E)

27. Jones, R., 1976 The use of marking data in fish population analysis. FAO Fish.Tech.Pap., (153):41 p. (E)

28. Pope, J.E. et al., 1975 Manual of methods for fish stock assessment. Part 3. Selectivity of fishing gear. FAO Fish.Tech.Pap., (41)Rev.1:65 p. (E)

29. Ricker, W.E., 1975 Computation and interpretation of biological statistics of fish populations. Fish.Res.Board Can., No. 191, pp. 1-382 (E)

V. INLAND WATERS

30. Bennett, G.W., 1971 Management of lakes and ponds. New York, Van Nostrand, 375 p. (E)

31. Ricker, W.E. (ed.), 1968 Methods for assessment of fish production in fresh waters. IBP Handbook, (3):313 p. (E)

32. Welcomme, R.L. and H.F. Henderson, 1976 Aspects of the management of inland waters for fisheries. FAO Fish.Tech.Pap., (161):40 p. (E,F,S)

33. ____________, 1978 Fishery management in large rivers. FAO Fish.Tech.Pap., (194):60 p. (E)

Part 3: Answers

	Author	6-1	6-2	6-3	6-4	6-5	6-6	6-7
STATISTICS	1. Bazigos, 1974	50	16	29	34	17	14	2
	2. Bazigos, 1974a	41	19	31	33	24	26	2
	3. Bazigos, 1975	38	16	21	19	3	5	5
	4. Bazigos, 1976	34	16	28	22	9	9	2
	5. Bazigos, 1977	41	16	24	28	12	14	2
	6. Brander, 1975	50	12	10	24	12	14	0
	7. Gulland, 1966	67	16	60	69	34	38	1
FISHERY BIOLOGY	8. Everhart, 1975	14	5	7	16	9	10	0
	9. Holden, 1974	66	12	41	59	38	36	0
	10. Kesteven, 1973	60	12	26	43	10	19	0
	11. Laevastu, 1967	52	14	26	50	17	24	0
	12. Royce, 1972	16	9	14	16	5	2	0
RESOURCE SURVEYS	13. Burczynski, 1979	26	12	22	17	10	10	2
	14. Forbes, 1972	59	12	40	41	16	21	3
	15. Gulland, 1975	64	14	28	47	16	29	0
	16. Saville, 1977	60	14	40	38	26	28	0
	17. Smith, 1977	59	19	24	29	19	14	0
	18. Ulltang, 1977	59	17	22	43	21	24	0
STOCK ASSESSMENT AND FISHERY MANAGEMENT	19. Beverton, 1957	53	19	21	57	36	43	12
	20. Beverton, 1966	57	16	26	41	22	19	3
	21. FAO, 1976	59	17	34	48	22	19	0
	22. FAO, 1978	28	14	16	26	16	16	0
	23. Gulland, 1969	71	16	60	78	60	55	2
	24. Gulland, 1974	45	16	26	40	17	26	0
	25. Gulland, 1974a	19	14	7	16	7	9	0
	26. Gulland, 1977	36	12	12	31	14	22	0
	27. Jones, 1976	64	16	22	38	12	19	0
	28. Pope, 1975	66	16	33	48	19	34	0
	29. Ricker, 1975	46	21	33	47	34	47	3
INLAND WATERS	30. Bennett, 1971	19	10	5	10	2	5	0
	31. Ricker, 1968	45	14	21	38	16	19	0
	32. Welcomme, 1976	33	14	14	16	10	7	8
	33. Welcomme, 1978	31	16	7	12	3	3	0
Total number of citations		884	276	474	680	340	394	23

QUESTION 7: Other FAO documents, not mentioned under Question 6, found particularly helpful

	Number of times
FAO Species Identification Sheets	8
Alverson manual (FTP No. 102)	5
FAO documents in general and species synopses	5
Mackett's manual (FTP No. 124)	3
(All others only mentioned once)	

QUESTION 8: Other books or manuals, not mentioned under Question 6, found particularly useful

	Number of times
Cushing (1968), Fishery biology	3
Cushing (1975), Marine ecology	3
(All others only mentioned once)	

QUESTION 9: Failure to obtain FAO documents

		Percent
Yes	11	24
No	35	76
Total	46	100

QUESTIONS 10/11:

(a) Welcome availability of documents in other languages:

Yes - 18 (38 percent)
No - 30 (63 percent)
Total 48

(b)

Languages:	Arabic	English	English/French	French	French/Arabic	Indonesian	Russian	Spanish	Tamil, Malayalam, Kanaris, French, German	Thai	Total
Number of replies	2	1	1	7	2	1	1	6	1	1	23

(c) Documents to be translated on priority basis:

Document	Frequency	Percentage of replies
Ricker, 1975	13	68
Pope, 1975	12	63
Smith and Richardson, 1977	9	47
Bazigos, 1977	9	47
Beverton and Holt, 1957	8	42
FAO, 1976	8	42
Gulland, 1977	8	42
Burczynski, 1979	7	37
Gulland, 1975	7	37
Brander, 1975	6	32
Ricker, 1968	6	32
Holden and Raitt, 1976	5	26
Gulland, 1974	5	26

QUESTION 12: Other documents which should be translated

All documents mentioned, except FAO Synopsis on biological data, are of local relevance.

QUESTIONS 13, 14 and 15: Volunteers for translations

Several positive answers (of interest to FAO essentially): 17 positive replies; 38 negative replies.

QUESTION 16: Topics quoted for new manuals or for manuals dealing with specific aspects (computer programmes for stock assessment, research for management)

	Number of quotations	
- Oceanography (including plankton), marine ecology		5
- Fishery biology (growth, stock determination, tagging, migrations, etc.)		6
- Species identification (shrimp)		2
- Sampling		2
- Stock assessment:		
- tropical (including tunas) examples	5	
- examples of solutions	1	
- quick assessment	1	
- assessment of tropical multi-species stocks, coral reefs	3	
- small calculator programmes	2	
- organization of laboratory data centre	1	
- data for stock assessment	1	
		14
- Surveys (mainly specific, practical aspects of acoustic surveys)		4
- Instructions for shipboard scientific operations		1
- Aquaculture		3
- Fisheries management:		
- shrimp fisheries	1	
- socio-economic aspects	4	
- research for management	1	
		6
- Artisanal fisheries		2
- Fishery development		1
- Fishing technology		1
- Fish processing		1
- Miscellaneous:		
- manuals for technicians	1	
- synthesis(?) of basic books (Ricker, B and M, etc.)	1	
- regional bibliographic lists	1	
		4
Total		52

QUESTION 17: Comments on distribution of FAO manuals, and general comments on their scope, etc.

- Information on manuals	
No clear and regularly updated lists of FAO manuals and related documents (including proliferation of new versions, etc.)	2
- Distribution	
- manuals not received regularly:	
by field projects	3
by national institutions	8
by individuals	1
from national agents	1
from FAO Documentation and Sales	(several, to be checked)
- need to create several depositing centres in each country	1
- General remarks regarding scope and value	
- most questionnaires recognize the value of manuals, however	
- some note: gap between theory/practice	1
ill-adapted to local conditions	1
too difficult	1

COMMENTS ON THE RESULTS

1. Availability of FAO publications in Institute libraries (Questions 6 and 17)

Taking the 19 Fisheries Technical Papers in the list, on average only 50.4 percent of the respondents said that these were available in the libraries of their laboratories and the FTPs most commonly available (Numbers 9 and 28) were available only in 66 percent of the libraries. The four manuals listed were slightly more commonly available, the corresponding figures being 62 percent and 71 percent (Number 23), respectively. These figures indicate clearly a failure of these publications to reach many of the libraries where they are most needed. If other libraries in the same town are included the corresponding figures rise to 65.3 percent and 78 percent for FTPs and 76.7 percent and 87 percent for manuals, which is still not satisfactory.

Although a number of the respondents had their own copies of FTPs and manuals, the percentage having their personal copies were substantially less than the figures for copies available in their libraries. Therefore personal copies are unlikely to have adequately filled the gap.

2. Availability of non-FAO publications (Question 6)

The eight non-FAO publications listed were available on average in only 31 percent of their laboratory libraries and the most commonly available one (Number 19, Beverton and Holt, 1957) was only available in 53 percent of the libraries.

3. Frequently used manuals, etc. (Question 6.5)

Gulland's manual No. 4 on population analysis stands out as the most used publication, with 60 percent of the respondents having used it at least twice during the previous 12 months. Next came two other FAO publications, Raitt and Holden's FTP 115 and Gulland's manual No. 3 on sampling and two non-FAO publications, Beverton and Holt, 1957 and Ricker, 1975, all with figures of 34-36 percent.

4. Other important FAO documents (Question 7)

Thirteen percent of the correspondents gave the Species Identification Sheets as being the FAO publications, other than those listed in question 6, that had been particularly useful to them.

5. Problems in acquiring copies of FAO documents (Question 9)

Twenty-four percent of the respondents had had problems in obtaining FAO publications. This clearly requires investigation to see what the problems are and how the difficulties can be reduced.

6. Translations (Questions 10 to 15)

The requests by seven respondents for translations into French and six into Spanish indicates the demand for more translations into these languages in particular.

The FAO publications at present only in English, for which the demands for translations were greatest, were

Pope, 1975,	Selectivity of gear
Smith and Richardson, 1977,	Fish egg and larva surveys
Bazigos, 1977,	Statistics for research

It is evident that there are plenty of offers to do translations.

7. Topics for which new or more specific manuals are recommended (Question 16)

The topics most frequently mentioned were the following:

Fisheries biology - determination of parameters
Tropical examples for stock assessment, including tunas, multispecies fisheries and reef areas
Fisheries management
Oceanography - plankton - marine ecology

With the exception of the last, there should be no problem in meeting these recommendations and several others, if the restructuring and integrated coverage of future manuals, proposed by the workshop, are implemented.

ANNEX 8

Aid in Research into Fishery Resources

An examination of experience in aid projects executed in Mexico, Peru, Chile, Argentina, Uruguay and Venezuela

by

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FOREWORD

> "To seek out the best through the whole Union, we must resort to other information, which from the best of men, acting disinterestedly and with the purest motives, is sometimes incorrect."
>
> Thomas Jefferson

TERMS OF REFERENCE

The study is aimed at identification and formulation of more efficient aid strategies in the field of fisheries research. The objective is to be approached by way of an assessment of "the achievements and limitations of programmes conducted under multilateral as well as bilateral aid schemes", with particular reference to:

(i) the impact that aid programmes had on the improvement of the knowledge of local fishery resources - namely, their nature, their potential yields and the main features of their reactions to various exploitation regimes;

(ii) the contribution of such programmes on the use made of the information generated on the fish resources in developing and managing national fisheries;

(iii) their contribution to the strengthening - in scope, number and quality - of the national scientific skills and to the eventual establishment and development of national research institutions;

(iv) the aid they have given in the development of local fishery research facilities (institutions, research vessels, equipment, etc.).

The six countries to which this study refers were named for the attention of the present writer because of his acquaintance with the research programmes in these countries. He has had extensive contact with the Mexican programme, beginning with a short mission in 1967 and then as Senior Officer of a major project there from the beginning of 1969 until June 1973; and he has maintained contact, notably through a mission in 1977 to design a new project. From 1973 until 1976 he was the Senior Officer of a project in Peru and subsequently maintained contact through participation in a review mission at the end of 1976 and in a review panel convened by the Government in 1977. His contact with the Venezuelan programme began with responsibilities as member of FAO Head Office staff in the 1950s, was renewed through short visits in the 1960s and 1970s and continued with leadership of a project, for six months in 1978, with short visits in 1979 and a brief assignment in January 1980. In 1977 he discharged a one-week assignment to advise the Government of Chile on fisheries research policy. In the last quarter of 1979 he was adviser to the Comisión Tecnica Mixta del Frente Marítimo, Argentina-Uruguay.

In consequence of this direct participation in these programmes, the study is made not as an outside observer objectively examining reports of events in which he had no part, but as one who had some part in the events and who wrote a substantial part of the documentary evidence available with respect to at least two of the countries. Naturally, he has made every effort to be objective in weighing up the evidence that he could assemble and he hopes that he has so far succeeded in this effort that the working party will be able to accept that his conclusions are based on an unbiased analysis. He recalls that his nomination to the Peruvian review mission was described by one person (in his opinion, a very biased person) as being like "putting the fox in guard over the chickens", but his report was accepted by the UNDP and, he understands, met with the approval of that organization.

INTRODUCTION

This paper is concerned with the acquisition of knowledge about fishery resources and with the use of that knowledge; and within that field it presents a report of an examination of the contribution of international aid projects to institutional arrangements for these activities in several Latin-American countries.

The term 'institutional arrangements' is to be understood, in a very broad sense, to signify the number and nature of the institutions engaged in the pursuit and application of resources information, in all aspects of the range, quality and usefulness of that information. Among these aspects are matters such as: the formulation and execution of research policy; the number and professional preparation of research workers; the selection of research objectives; the planning, programming and execution of research projects, and administrative and logistic support to research. Also included are: awareness of and access to literature; channels of publication, and facilities for exchange - between institutions, in the course of national and international meetings, and through fellowships. Lastly, although not exhausting the list, attention must be paid to the public and political relations of research, the opportunities given to research workers, not only to give an account of their work, but also to offer an interpretation of its significance in practical affairs and to participate in the formulation of management plans.

The purpose of an aid-in-research project is to assist the recipient government in such of these aspects as the situation may demand. A variety of means of providing such assistance is available; they fall under three main headings: experts, equipment and fellowships, of which the first figures most prominently and undoubtedly has been the most expensive. The 'expert' component has been in the form of short-term consultancies, long-term assignments of one up to five and even more years, short-term training missions, and review panels; the experts' work has been in advising on the planning and conduct of research, participation in ongoing programmes, and training - on-the-job or in training centres; in some cases only one of these activities, in other cases combining all of them.

The task of whose execution this paper is a report is to review past aid-in-research projects with regard to the strategies adopted in planning and executing them in the hope that the review will indicate the relative effectiveness of each of the methods and perhaps point to ways in which, individually and in combination, they might be improved.

Strategy was originally defined as "the art of projecting and directing the larger (military) movements and operations of a campaign"; more recently strategists would undoubtedly hold that their work is more scientific than artful, although 'strategem' does mean a trick. Be that as it may, in modern usage, a strategy is a 'master plan for the achievement of some objective, specifying the methods to be employed and the resources available for the application of those methods, and a timetable for the operations". Following this usage an examination of a set of strategies with a view to comparing them and assessing their relative effectiveness entails an examination of objectives, methods, reconciliation of methods and available resources and timetables.

The objective of aid-in-research projects is the rendering of aid to the conduct of research. Not, be it noted, the conduct of research itself, although in some situations the conduct of research may be of assistance to a government in its programme of management and development of its fisheries. As the first step in this study, it is advisable to ensure that there is no misunderstanding of what can be meant by the expression 'aid-in-research'.

THE NATURE OF AID IN RESEARCH

A rigorous definition of 'aid' is "action, by way of advice on, direct participation in, and/or provision of equipment, facilities and other elements to an ongoing activity, which, by complementing and in various ways, influencing that activity, increases its effectiveness and promotes the accomplishment of its objective". By this definition, aid is complementary action; it is not the provision of experts or equipment as such, but what is done by and with them to complement and influence an ongoing activity; nor can aid be equated to the activity it complements, still less to the result of that activity. The effectiveness of aid can be estimated if a means can be found of ascertaining the progress that would have been made in the assisted activity if the aid had not been given. The implications of the above definition for evaluation procedures are discussed in a later section; at this stage we can discuss its implications for the design of aid projects.

A prior condition for the specification of aid to be given, in a particular situation, is an identification of the activity (or activities) to be assisted. In the field of research it is convenient to recognize four principal operational kinds of activity relating respectively to:

(a) formulation of research policy;

(b) formation and maintenance of research capability;

(c) the actual conduct of research;

(d) the application of research results.

The last is of particular importance in an applied science such as fisheries biology. While the members of these classes are in general well known, it is advisable to list those of the second, since it is with these that a great part of aid effort has been concerned and to which, therefore, much of this report will be devoted. Moreover, as will shortly be discussed, it can be argued that it is in this area that aid can have its deepest and most lasting effect.

The acquisition, development and exercise of a capability for research in a particular applied field is a complicated cultural process of which the creation of specialized research institutions is only one part. In addition, on the one hand, such institutions must be given an appropriate niche in the national, social and economic apparatus, given administrative and logistic support and means of maintaining relations with other institutions, especially academic, from which to draw ideas and personnel, and to which to expose their work for criticism; on the other hand, they must have relations with the industry from which they draw information and for whose use their research results are obtained. The creation of an institution involves a wide range of activities, from taking a decision to create it and defining its field of action, through recruitment, preparation and further training of personnel, acquisition and assembly of equipment, creation of support services, provision of accommodation, and establishment of procedures for planning, programming, directing and monitoring research, to the establishment of procedures of periodic review aimed at maintaining competence.

Although the reference here is to the process by which national programmes of applied research, and in particular those of fisheries biology, become established, the process is general for all research and has operated through most of the world. It is essentially national in character and indeed cannot play its full course unless it is national. That does not mean that it ever results solely from national effort: indeed, there are probably few programmes in which foreign personnel have had no part and it must be doubtful whether any have developed without drawing on ideas and information from other countries.

Thus, the aid-in-research programmes of the present epoch must be seen in historic perspective and as innovative only as to the manner and magnitude of the aid effort, but not as something new to the history of research institutions.

This discussion is presented not with an idea of laying down rules for giving aid to such programmes, but discovering, by detailed analysis, the kinds of aid that can, or could or might be given.

In principle, aid in this field is seen as taking the form of: advising, training and participating in activities so as to further their completion; these activities, by 'experts', are facilitated by the provision of equipment. Whether the aid in a particular case should consist of only one, or a combination of these modes, depends on the activity to be assisted, and the answers to both this question and to the question of what particular action within each mode should be taken, should be framed in terms of the state of the programme to be assisted. It would seem then, that the kind of aid action required for a particular situation can be specified by reference to activity class, particular activity and programme state; but this may not be enough, if the programme to be aided stands within an institutional frame which exercises a strong influence on the programme.

To elucidate the matter further, we must now look more closely at the nature of the effect that aid can have, remembering that the effect is to be seen in the activity that is to be assisted. Whilst it is true that we should expect the effect of aid to be discernible in the results of the activity, it will there be mixed with effects of other contributions so that accurate identification may be difficult and measurement will almost certainly be impossible. In much writing about aid programmes, the role of aid is described as being analogous to that of a catalyst, essentially in the appearance of a process being accelerated by the presence in small quantity of an element which is itself not changed by the process. Whilst obviously no direct correspondence holds between the activity of a true catalyst and that of an aid agent, a closer examination of the analogy can be of heuristic value and might lead to development of a theory of social catalyst. For this purpose, we take the criteria of catalysis, as follows:

(i) The catalyst is unchanged chemically at the end of the reaction.

A parallel statement with regard to an expert, while it might be largely, but not wholly, true with regard only to his role in some ongoing process, could scarcely be true at all with regard to himself, culturally, in consequence of his sojourn in a foreign country. But, even in the limited area of exercise of his professional talent, an expert undoubtedly learns, not only by the learning that comes from all teaching, but also by virtue of application of his expertise in, to him, novel circumstances. It follows that a criterion of no change in the agent could not be retained in its simple form for a concept of social catalyst.

(ii) A small quantity of catalyst is often sufficient to bring about a considerable amount of reaction.

This is probably the central and dominant characteristic of an expert's role in the mind of those who use this analogy, but there is a problem of quantifying expert presence (other than in a measure of man-months) and application of this criterion must be subject to considerations of timeliness and quality of presence, and of the nature of the 'substrate' upon which his presence is to have effect.

(iii) The catalyst is recovered after completion of a reaction and in the presence of a new reactant will continue to promote change.

(iv) The catalyst does not affect the position of equilibrium in a reversible reaction.

Since this criterion derives from the fact that a catalyst, being unchanged at the end of a reaction, can contribute no appreciable energy to the system, from which it follows as a consequence of thermodynamics that the same position of equilibrium should be ultimately attained whether a catalyst is present or not, adoption of this criterion for social catalysis would require an identification in social systems, and in social processes of research, of counterparts to energy (to drive a process), equilibrium states, and 'position' of equilibrium.

(v) The catalyst does not initiate the reaction; it merely accelerates a reaction which is already occurring, although perhaps extremely slowly. The function of a catalyst is to make the same overall process take place by an alternative path involving a smaller free energy of activation.

The first part of this criterion corresponds precisely to the intention of the social use of the term and so, probably, does the second part, excepting the last seven words, unless a counterpart to "free energy of activation" can be found. But it is unnecessary to do so, and indeed it would be misleading to press the analogy with chemical reaction in this way: we are not dealing with reactants, activated complexes and products. It is sufficient to take it that a social agent can act in some respects like a catalyst when:

- it does not initiate a process;
- it accelerates a process;
- it effects that acceleration by directing the process through an alternative path and brings about economies in the execution of the process;
- its 'costs' are small compared with the total cost of the process.

But it differs from a catalyst in that it may itself be considerably affected by its participation in the process, and in that situations may occur in which a process would not operate if the agent were absent. Indeed, the "social catalyst" differs importantly here from the chemical catalyst in that its success in a particular situation is to be judged by the degree to which the process will continue in its absence; in other words, an 'expert' should work progressively to make his presence unnecessary with respect to each of the activities he assists.

We can agree then, that a social agent can act like a catalyst and we may use the term without implying that the process within which it operates corresponds to a chemical reaction. On that understanding, we can apply these criteria to various instances of aid to assess the degree of their conformity with the concept of social catalyst. This procedure should show whether catalysis is a necessary or only a desirable characteristic of aid and, if the latter is the case, the conditions under which catalytic aid is appropriate and those under which non-catalytic aid is more suitable.

Further examination of the nature of aid-in-research must await the availability of evidence from case studies and indeed it is to be recognized that in the present study, the formulation of some conclusions on the nature of this aid is both a result to be drawn from the review of past aid projects and a basis for that review.

ON PROJECT EVALUATION PROCEDURES

One would have expected that the instructions according to which projects are evaluated would embody the basic principles that govern the design and execution of aid projects since it is to be supposed that one of the major measures of the success of a project would be the degree to which it had conformed to those principles. Further it would be expected that the results of following such instructions would be a mine of information on the problems of observing those principles, and on the consequences of departing from them. It must be said, however, that such expectations are realized in few review mission reports and scarcely at all in the instructions. It must be said at once that this situation appears to be the consequence of a neglect of the most elementary principles of systems analysis. The matter can be illustrated quite simply as follows: Suppose one is concerned with a situation in which two lines of action converge to produce a particular result; suppose each line to consist of a sequence of steps, each step consisting of an action leading to result which must be achieved before the next step can commence; this situation is represented in Figure 1 where the steps of one line are indicated by the letters A, B, C, etc., and of the other line by the letters M, N, O, etc., and the end result by the letter X. Now, suppose further that execution of one of these steps, say P, is subject to some tributary line of action, and let us represent its steps by the letters a, b, c, etc.

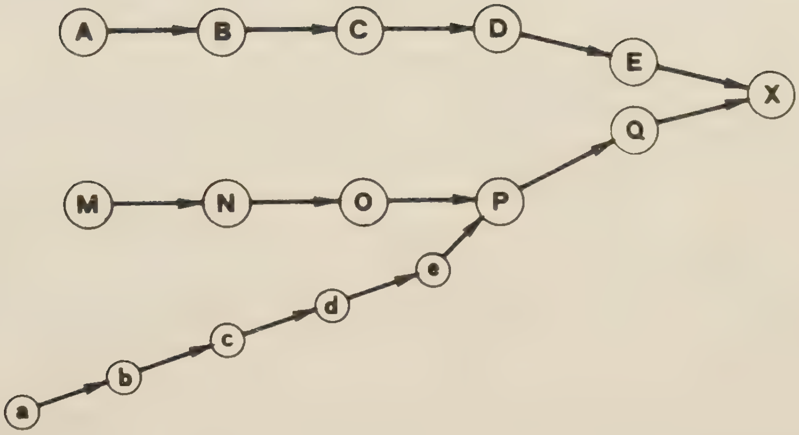

Figure 1

The two main lines of action could be, for example, separate approaches to measurement of stock biomass and the tributary line could be either the provision of some necessary facility (for example, if step P were collection of plankton at sea and the tributary line was that responsible for providing sea-going opportunity), or something of qualitative effect, such as logistic support or aid. Now while the speed, efficiency and timeliness of the completion of each step will determine these characteristics of the accomplishment of the final result X, that final result cannot be attributed to any one of the steps alone, even if it should be the case that there was one step whose full and timely completion determined whether or not the result X could be obtained. That is, the effectiveness of a line must be considered of all steps together, as the result of the fit of one step to the other; within this measure an assessment can be made, of course, of the efficiency of execution of particular step which, if it falls short of intended efficiency, may be held responsible for some or all of whatever short-fall there might be in the final result X, but it remains that X is the result of entire lines and not of particular step. If this holds for the two main lines, it holds even more for the subsidiary line.

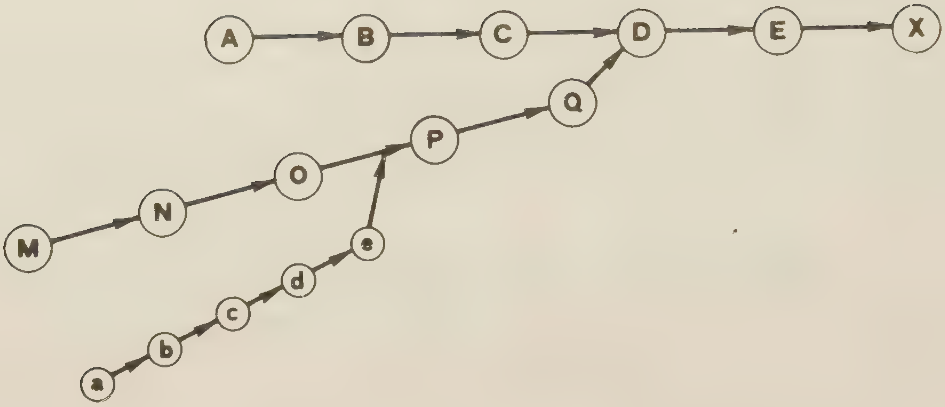

Figure 2

Next, suppose that the situation is as presented in Figure 2, in which X stands for the catch of a fishery, the line A, B, C, etc., stands for the sequence of operations in fishing, the line M, N, O, stands for research on the resource being fished, and the line a, b, c, etc., for aid-in-research. Obviously, it cannot be claimed for the line a, b, c, etc., that it alone is responsible for the result X; nor can it even be claimed that it is responsible for the step Q-D. Again, the effect at step e-D results from the entire line a, b, c, etc., and not solely from any one of these steps. Thus, evaluation procedures that imply a direct connection between number of man-months of expert time and amount of catch or even number of research reports, are unlikely to lead to valid conclusions. Many items of monitoring and evaluation procedures can at best yield information on the efficiency of accountancy and administrative operations.

Clearly the objective should be, in terms of Figure 2, an examination of the nature and effect of a step e-D and of how the steps of the line a, b, c, etc., contribute to that effect. Even then the story will be incomplete, because the line a, b, c, etc., is itself subject to influences and its contribution to the effect of the step Q-D depends in part on the entire line M, N, O, etc.

Evaluation thus is a complex and difficult matter which, obviously, cannot be effected without some clear idea of what it is that line a, b, c, etc., is expected to achieve, of how it is expected to achieve that effect, and of the conditions that may affect its own operation. It is for this reason that we have spent so much time in trying to discover the true nature of aid-in-research.

The matter is so critically important to this study that we pursue the analysis further and for the purpose take the relationship in which an expert stands to his counterpart, probably the prototype of aid situations. In this relationship no meaningful measure can be taken of what passes in the relation between the expert and the counterpart; the flow is informational, verbal and non-verbal. The expert's influence can be assessed, if at all, only in terms of change in the counterpart from the beginning of the association to its end; the change might be of abilities, or of demonstrated competence, or a realized performance; it might even be thought that the expert's influence might be demonstrable in a change in the work of the unit to which the counterpart belongs, or in the output of that unit. However, as the argument of Figures 1 and 2 shows, none of these changes can be attributed solely to the influence of the expert. In the case of the counterpart himself, any discernible change must be held to have involved, in some measure, each of the following distinct influences:

- the counterpart's own will and ability to improve himself;
- the cultural and educational climate of the country;
- the institutional setting in which the counterpart worked;
- the state of the science;
- the efforts of the expert.

One can imagine an experimental approach to this matter, with comparisons, for example, between participants in an expert/counterpart relationship on the one hand and non-participants on the other, but taking a practical view, only partial results could be expected.

In the reality, since no measure is taken of counterpart initial competence, it is difficult to see how anyone could expect to know by how much a counterpart had changed or, indeed, whether he had changed at all; and since little or no account is taken of influences other than of the expert, it is difficult to see how an admissible claim to a result could be made.

Perhaps it will be argued that, over the relatively short time span of most projects, and considering the nature of the situation in which each expert works, all influences except that of the expert can be considered to be constant and without significant effect in the process of change and therefore whatever change is demonstrated can be attributed to the expert. To carry conviction, such a line of reasoning would have to be supported by evidence of the constancy and insignificance of the other influences and the gathering of such negative evidence is likely to be even more difficult than gathering positive evidence. Moreover, some of those influences may be negative and repressive at the beginning of a project and an expert's work may be chiefly in converting them to being positive, after which the observed change in the counterpart results from his own effort. Thus the institutional setting may be unfavourable, even hostile, to the work of an individual; necessary technical services may be lacking; logistic support to fieldwork may be inadequate; direction of research may be incompetent; continuity of research may be made impossible by frequent changes of programmes or by the necessity to respond to demands from administration that research staff undertake ad hoc inquiries into short-term local problems; and it even occurs that personal animosities lead to the concentration of difficulties of these kinds upon the work of an individual. Behind this array of problems stand two other major conditions: the first is the matter of the economic condition and career prospect of a research worker; the other is the matter of research leadership. If a worker is constantly worried about financial and other domestic problems, he cannot work as well as he might if he were free of such problems; if he must take a second occupation, as many do, his energy for research is reduced; if, in addition, he can see no prospect of improving his economic condition or of advancing his career, he is unlikely to show initiative or make special efforts, and instead is likely to simply go through the necessary motions of appearing in the laboratory, performing tasks assigned to him and filling gaps in time with conversation. Lack of leadership has similar effects and when its place is taken by a hierarchical organization in which plans are formulated at the summit and orders for work to be done are transmitted down, with frowns or even reprimand for independent thought or action, the result is probably worse. (What is amazing is the number of persons who, in circumstances such as this, maintain a lively interest in their subject and manage to accomplish some work; for example, a technician who, though without degree, had built up a large collection of fisheries literature, knew more about fisheries biology and the fishes and fisheries of his country and worked more willingly than most of his degreed colleagues, although he could not obtain promotion, lived on a pittance, and did not have a table or desk for himself, either in his home or in the station to which he was assigned.)

To suggest that institutional setting, in situations such as these, is without influence or that the direct relation of expert to counterpart alone can be effective, is unrealistic. If in place of a one-expert, one-counterpart situation, we consider an entire project with many experts and consultants and many counterparts with fellowships and equipment, we must see the task of evaluation as extremely difficult and perhaps impossible by the methods at present employed and with the current objective of seeking to establish claims to particular achievements. An alternative approach could be developed from a decision to see evaluation, not as a matter of O and M judgements for the international executing agency, nor as a justification of aid programmes, but as part of the aid process itself. By this approach, attention would be directed upon changes sought, brought about or not achieved and on all agents that may have had a part in or have influenced the processes leading to the changes; an aid agency adopting this approach would examine its association with a developmental programme without attempting to claim credit for successes or to disclaim responsibility for failures. A provisional scheme for the organization of material for such an evaluation is given in Table 1.

Table 1

I.	What changes have taken place,		
	of 1st order:	in research capability	- Personnel number, quality, and leadership - Organization - Equipment, facilities, and services
		in knowledge	
	of 2nd order:	in institutional frame	- For the organization, promotion, funding, direction, etc., of research, including the formulation of research policy - For the formulation of demand for particular research results, for application of results, and for feedback
II.	What influences may have had some part in bringing these changes about:		
	A. Local:	From Industry, in creating need and making demand for research results From Administration, in the formulation of fisheries policy and execution of management and development projects From Education, in providing appropriate general and special training From Cultural and political attitudes generally and in particular, in the respect of attitudes to science, environment, socio-economic aspects of primary industries and similar matters	
	B. International:	From changes in the paradigm of each of the relevant sciences From the "invisible college" From international exchanges	
III.	What role has been played by aid projects:	Absolute contributions, of ascertained fact, equipment and original ideas Training, encouragement and guidance	

ON THE HISTORY OF FISHERY SCIENCE

Among the influences that have had effect on the situations to which aid has been given to research on fishery resources, that of trends in fisheries science and especially, but not solely in fisheries biology, is of considerable importance.

Until the second world war, fisheries science consisted almost only of fisheries biology, but in post-war years, up to 1960, considerable advances were made in fisheries gear technology, fisheries naval architecture and fisheries food technology and some woolly ideas in fisheries economics were formulated; FAO played a major part in promoting the first three and must accept some responsibility for the last. At the same time, the initiation of the series of yearbooks of fisheries statistics and the Organization's efforts to standardize the methods of collecting, compiling and publishing fishery statistics, had marked effects on fisheries administration in many countries. All these developments, each important to its own sector, had notable effects on the organization and conduct of research, interacting significantly with fisheries biology.

In the 1950s, fisheries biology underwent virtually a revolution with the convergence of the work of Ricker, Beverton and Holt, Baranov and others in a new paradigm of which the distinctive feature was population dynamics with its models and its calculation of Maximum Sustainable Yield (MSY). By 1960, the Commissioners of important international fishery bodies were expecting to be given an estimate of MSY for each stock and to be advised of regulatory measures which would define for each fishery an operational regime, characterized by eumetric fishing and the maintenace of MSY. The established methods of sampling catches, age determination and description of stock composition were assimilated to the new paradigm supported by, perhaps with lessened attention to the still older methods of life-history studies, taxonomy and the tracing of migration paths. In the forefront of practical work stood growth studies with measurement of mortality and recruitment rates and talk was mostly about these rates together with rates of catch-per-unit effort. But already the Schaeffer model had emerged and it seemed, at least to some, that the golden age had arrived when a stock assessment expert could dispense with all data concerning a natural population in the sea and work solely with data of catches taken and effort expended.

The two succeeding decades, with which the present study is concerned, saw intense activity in further development of the population dynamics set of methods simultaneously with a search for substantial revision of the general paradigm. Work of the latter kind gained momentum in the 1970s with efforts to find satisfactory models for the stock/recruit relation and, partly in response to a need for better environmental information in connexion with that relation, with the efforts to find a more general ecological model of exploited populations; that last drive was reinforced by the recognition of the importance of interspecific relations, and all these trends have led to a search for alternatives to the concept of MSY. At present, the term probably in most common use is Total Allowable Catch.

At the start of this period none of the developing countries possessed the background of bionomic research and the great accumulations of stock analysis data and catch and effort statistics to which European and North American workers could turn. Moreover, few of the Third World fishery biologists had participated in the discussions at the many meetings of ICES and ICNAF, in which new ideas were constantly being debated and tested. There was also the problem of language; the bulk of the important contributions were in English, German and the Scandinavian languages. Whilst it is probably true that in the later 1940s and early 1950s, nowhere in the world, excepting the Northeast Atlantic and its lesser seas, could the Beverton-Holt work have been produced. It was still true in 1960 that such work could not have been undertaken in Latin America.

It would be untrue to say that nothing had been done in fisheries biology before 1960 in Latin America, but at that time the national research workers (which excludes the IATTC team) had to establish a body of statistics and acceptable data and to enlarge their understanding of the life-histories of important species and give precision to their taxonomic work. But at the same time they had to prepare personnel and establish or shape their research structures. While familiarizing themselves with the current paradigm of fisheries biology, they had also to adjust their view of that paradigm to accommodate the new emerging ideas.

It was against that background that aid projects were designed and the task of this study is to examine how, and with what success, those projects assisted the national workers to overcome the difficulties that beset them.

LATIN AMERICAN EXPERIENCE

The Latin American region is especially apt as object of study for the purposes of the Working Party, because of the nature of its fisheries and the dramatic events within those fisheries (especially the spectacular expansion of the Chile-Peruvian anchoveta fishery and its equally spectacular fall) and because of the number and variety of projects conducted in the region in response to demands motivated largely by those events.

It can well be argued that the aid programmes in this region contributed in a major way to the special position the region holds in a comparison of national resources available for fishery research, as shown by the following table developed from tables in the paper by Dawson (1977).

Table 2

	Developing Countries			Developed Countries (d)
	Africa (a)	Asia (b)	Latin America (c)	
Fishery scientists:				
(i) per thousand scientists	10.32	5.46	15.36	0.85
(ii) per million of population	0.97	0.28	3.37	2.10
(iii) per thousand million $ GDP	1.96	2.12	3.33	0.44
(iv) per thousand tons of catch	0.07	0.03	0.32	0.05
Value of fish catch as proportion of GDP	0.01%	0.02%	0.36%	0.002%

(a) 7 countries; (b) 8 countries, except index (i) for which only 2 countries; (c) 4 countries - Argentina, Peru, Uruguay and Venezuela; (d) 4 countries.

Although the Latin American result in this table is heavily weighted by the Peruvian data, figures from Mexico and Chile would probably reduce the results only slightly. Thus, fisheries science has acquired a relatively high status in Latin America, compared with its numerical standing in other regions.

The region is also of special interest because of the institutional setting in which the projects were conducted and of the cultural and scientific climate, with strong associations maintained for some centuries with European culture. An adequate understanding of events in the conduct of projects in these countries, on which alone a proper evaluation of their strategies could be made, cannot be got without some reference to that background.

While the 'country' sections that follow give some details of the scientific setting in which projects were placed, it must be said at the outset that the aid-in-research activities of the 1960s and 1970s were not undertaken in an unexplored and uncultivated field. This is abundantly clear from the papers of the first ten meetings listed in Appendix 1, and still more from the bibliographies to those papers. Even before the second world war substantial taxonomic, marine biological and oceanographic work had been done in these waters; much of it, certainly, by visiting scientists (especially in the course of the major oceanic expeditions), but much by resident scientists. Then the period 1945-1960 saw a notable advance in marine sciences and fisheries biology in most countries of South America, much of it taking its stimulus from the teaching and example of Popovici, Angelescu, Schweizer and de Buen. In evidence on this point, we can take the encyclopaediac work of Popovici and Angelescu (1954), the massive study of hake by Angelescu, Gneri and Nani (1958) and the paper presented by Angelescu and Gneri to the Tenth ECLA Session in 1963, which gave an account of the nature of fishery resources, of the problems concerned in their exploitation and of the methods available for research on them, together with a review of the knowledge at that time of the resources of Latin America, which is still relevant today. This work provides a major reference point against which to examine the changes that have taken place in the intervening years. In the same period, Osorio-Tafall, Lindner and others were giving a lead to work in the north and the staff of the Inter-American Tropical Tuna Commission, ranging widely over the Pacific coast, added greatly to the knowledge of the tunas and baitfishes of those waters and of their oceanography, and to the theory and practices of research on fishery resources, while training many local people.

MEXICO

Background to 1959

Industry: Already, before 1959, the industry was embarked on development. From a catch[1/] of 17 100 t in 1938, production increased to 192 400 t in 1959, which was a 10.5 percent exponential rate of increase. However, North American fishermen at the same time took a catch from these waters slightly greater than that taken by nationals. In 1949, 51 percent of the catch in Mexican waters was of tunas, virtually all taken by North Americans. The most important component of the Mexican catch was shrimp, important in both weight and value; next came sardine - a very great part of the increase in local catch came from these species. From about 68 000 t in 1949, the local catch nearly trebled in the next decade, in substantial part by the increase in shrimp catch, but since the sardine catch scarcely increased in that period and the tuna catch remained small, the greatest part of the increase came from general expansion of the fisheries. In a deeper study the technological, investment and other aspects of this expansion would be examined in detail.

Cultural: In 1959 Mexico had: Academia Nacional de Ciencias (founded in 1884), 6 learned societies concerned with biological sciences (1 founded in 1868 and refounded in 1938), 2 institutes of research in biological sciences, and more than 25 universities (2 founded in the 16th Century, 2 in the 17th Century, 3 in the 18th Century and 6 in the 19th Century).

[1/] Unless expressly indicated, catch statistics are taken from the FAO Yearbook of Fishery Statistics. Although fully aware of the doubts that must be entertained concerning many statistics, especially those relating to years before 1960 and recognizing the need for caution in drawing conclusions from them, the FAO statistics are quoted in this paper without any apology or reservation other than that which is expressed here in this footnote

Administrative and Political: Political, legislative and administrative reference to fisheries in Mexico extends back (Sierra, 1978) to the formation of a Secretariat for Development, in 1853 and appear in the Civil Code of 1870, the Fisheries Order (Instrucción) of 1872, the Pearl-Shell Diving Regulation of 1874, the Fisheries Law of 1888, the Fish-Culture Regulation of 1891, and subsequent instruments of 1894, 1902, 1916, 1917, 1923, 1925, 1932, 1938, 1947 and 1952, the last five being fishery laws. All the last five provide for regulation of fishing activities and for the granting of concessions, permits and authorizations subject to observation of the regulations. The powers of the National Fisheries Institute were set out in the 1925 Law. The reservation of the fishing of certain species to members of cooperatives appeared in the Law of 1947.

Scientific Interest in Living Aquatic Resources and Fisheries: It is evident from literature that a lively interest in living aquatic organisms existed for some long time in Mexico, and that concepts of conservation were very much alive. The case of shrimp can serve as example, the facts come from papers by Mauro Cardenas F. In the period 1940-45, 17 000 t of shrimp were exported to the USA by an industry that was entirely Mexican. In 1944-46 a Mexico-North American Joint Fishery Commission, composed of García, Lindner and Cardenas carried out research on shrimp, chiefly from Guaymas. In 1950 Cardenas presented a thesis on the Biology of the Penaeidae of the Northwest of Mexico in which he gave an account of the industry, description of research methods and biological results. This thesis was presented in 1950 at the National School of Biological Sciences of the National Polytechnic Institute. Part of the thesis was published in 1951 in the Bulletin of the Mexican Society of Geography and Statistics, as from the Geological Office of the Secretariat of Water Resources, whose Chief wrote a foreword to the paper expressing advanced views on the principles of conservation. Another part of the thesis was published in the same year in the Review of the Mexican Society of Natural History. This work resulted from the collaboration of workers of Mexico, the USA and Spain; Cardenas makes warm acknowledgement of the training and encouragement he had from Osorio-Tafall and from Lindner, and his bibliographies list several papers by Osorio-Tafall.

More widely, in 1952 appeared two publications which gave clear indication of the state of thought of Mexico about fisheries. One was a book by Alejandro Quesada, of Costa Rica, entitled La Pesca. This was part of a study of the Economic and Social Structure of Mexico realized by the Nacional Financiera, S.A. and is surely one of the earliest comprehensive accounts of a country's fisheries; it deals with all aspects of the fisheries, from resource to consumer and ends with an examination of the political economy of the industry, its administration and related legislation. The other was a paper by Beltran, from the University of Mexico and the Mexican Society of Natural History (of which he was Permanent Secretary), on Fishery in Mexico, its present state and a project for its promotion. Beltran proposed the establishment of a National Commission for Fisheries and Fish Culture.

The Period 1960-79

In this period the industry continued to increase, at a rate of 6.5 percent which, although less than the rate for the period 1938-59, meant substantial absolute amounts. The rate calculated for the entire period 1938-77 was 9 percent, while over most of the period, from 1948-77, total world catch increased at the rate of 5 percent. Comparison of Quesada's catch-composition table for 1949 with FAO's tables for the 1970s, shows that the catch increased in more or less the same proportion for all species groups, resulting in substantial absolute gains in percomorphs (with probably a widening of the range of species exploited), clupeoids, crustacea, mollusca and algae. These increases were accomplished by expansion of equipment, on land as well as at sea, and by technical advances in equipment and methods.

Interest in fisheries increased very greatly. The Mexican Institute of Renewable Natural Resources was especially active, publishing in 1963 a volume on the Present State of Hydrobiological and Fishery Research, convening in 1963 a round table on the Problems of the Fishing Industry and in 1966 a round table on the Problems of Hunting and Sportfishing in

Mexico. Both the National Autonomous University of Mexico and the Mexican National Polytechnic Institute prosecuted active programmes in aquatic biology and ecology including fishery studies and similar work was carried out in other academic institutes; especial note should be taken of programmes in Guaymas and Ensenada. National Oceanographic Congresses were convened. Mexico was host, in 1967, to the World Congress on Shrimps and Prawns, convened by FAO.

This increased interest was strong also in administrative circles. State administrations and regional bodies initiated programmes and held large meetings. Presidential candidates convened very large national meetings to discuss the problems of fisheries and the legislature undertook extensive inquiries, especially in connexion with the drafting of the Fisheries Law of 1972. Fisheries administration was transferred from the Secretariat of the Navy to the Secretariat of Industry and Commerce, first as a Directorate General, then as a Sub-Secretariat and currently it is a separate Secretariat. Creation of the para-governmental corporation, Pesqueros Mexicanos, gave an instrument for developmental initiatives. Several Secretariats, notably Water Resources and Navy, undertook fishery-related activities.

During the period, FAO executed two fishery research and development projects on behalf of UNDP and initiated a third; at the same time Unesco executed on behalf of UNDP a marine science project which had some fishery (training) component. The first FAO project was effected through the services of a single expert for little more than one year. The second project was much larger, involving 575 m/m of expert, consultant and associate expert time and 846 m/m of counterpart time. Of the 37 foreign personnel, 17 had assignments of 12 months or more, the assignments of the other 20 averaged 3 months. Fellowships, covering in all about 37 months, were granted to 25 counterparts; most of the fellowships were short-term, for the purpose of attending scientific meetings and training centres. One major training centre, with extensive international participation, was conducted by project staff; it dealt with research on shrimp. The project had the use of two research vessels.

The activities and 'results' of these projects are described in terminal reports, in technical papers and other publications, but as will be understood from the argument of the Introduction of this paper, these are neither the sole nor the best evidence of the effect of the projects.

Considering the background, so sketchily described here, and the energetic local action of the period under consideration, it would seem unlikely that the effect of any particular item of aid would be discernible in the present scene, but undoubtedly effects are there. In the late 1960s the presence of Osorio-Tafall, Lindner and the de Buens could still be observed in methods and attitudes, but Mexican workers had to assimilate the population dynamics paradigm with its discipline of systematic collection, compilation and analysis of stock data; at the same time they were becoming aware of the new currents of thought in fisheries biology. The major research objectives at that time were, first management information for the shrimp fisheries and second a general description and measurement of the size of demersal stocks and stocks of small pelagic species. Perhaps the former was less urgent than at that time it was thought to be since the main problems were technological and socio-economic; it can be argued that the most practically useful contribution research can yet make to shrimp fisheries is to indicate, from monitoring procedures, the appropriate time for beginning to fish each stock in each season. The latter objective had real urgency for there was still a disposition in some quarters to describe Mexican fishery resources as 'immense', chiefly on the ground that Mexico had a great length of coastline on two oceans. Work in the course of the project made important contributions to a more accurate assessment of the situation, but in the view of the very ambitious production targets set in the National Plan for Fisheries Development 1977-82, it cannot have made a deep impression.

The Mexican situation was not one in which an institute was to be created, it already existed, but one in which lines of research were to be accelerated, with improvements in quality, relevance and timeliness of results and in which, to this end, personnel had to be given further training (on-the-job and through special courses and fellowships) and advice had to be given on planning, programming, directing and monitoring the research projects and on the provision of services and logistic support to the projects. In pursuit of these objectives, foreign personnel collaborated in the acquisition of valuable new information with regard to the resources. Many of the counterparts made considerable advances of competence in the course of this work, and although no measure can be made of the degree to which the experts were able to assist in this, there is no doubt that some of the experts stand alongside Osorio-Tafall and Lindner in the history of Mexican fisheries biology.

PERU

Background to 1959

Industry: Like Mexican fisheries, those of Peru were already expanding before 1959; indeed the dramatic development of the anchoveta fishery was well underway by that year. Taking 1955 as the first year of expansion of the anchoveta fishery, the fisheries generally had been increasing since 1938 at a rate of 13.5 percent. For some long time the development of the anchoveta fishery had been resisted by the Guano Company with the logical argument that human exploitation of anchoveta would cause a decline in the bird population and hence in the production of guano, the soundness of which was proven by events. Once started, the anchoveta development moved rapidly and by 1959 the industry was demanding research help which, at that time, they saw only as assistance in locating the concentrations of anchoveta.

Cultural: The Lima Academy of Exact, Physical and Natural Sciences was founded in 1959; the Geophysical Institute was founded in 1919; apparently these institutes took little interest in marine science, at least up to 1959. At that time Peru had 33 universities, one founded in the 16th Century, one in the 17th Century, 3 in the 19th Century and the rest in the 20th Century. The "Javier Prado" Natural History Museum (founded in 1918) of the University of San Marcos was the venue for some research in marine biology. The National Meteorological (founded in 1928) was accumulating data which were later to prove valuable. The principal and perhaps the unique site of marine science research was the Guano Company (Popovici).

Administration and Political: Administration of fisheries was effected from the Fisheries and Hunting Division of the Ministry of Agriculture until the creation of the Ministry of Fisheries in 1970, in recognition of the great economic significance of the anchoveta fishery.

Scientific Interest in Living Aquatic Resources and Fisheries: In Book I of Volume I of the Historia Marítima del Perú (1972) an article on oceanography, by M. Mugica, has a bibliography of which 34 items appear to relate directly to work on Peruvian waters; six of these items (18 percent) appeared before 1960, all of them by non-Peruvians. The bibliography to the article on biology of the seas, by R. Sanchez, has 129 such citations of which 27 (21 percent) appeared before 1960 and of these three were by Peruvians and one had joint Peruvian and foreign authorship. In default of a comprehensive bibliography of marine science in Peru, perhaps these examples can be taken as representative of scientific activity in this field in Peru, before 1959.

In 1941 a US mission headed by Fiedler made a study of Peruvian fisheries. In the early 1950s an Italian experimental fishing expedition visited Chilean and Peruvian waters and Bini reported on the fishes. Schweigger, working for the Guano Company, did extensive oceanographic work in the 1940s and 1950s and other staff of the Company, including Jordan and del Solar, carried out biological studies. With the opening of the anchoveta fishery a national fisheries society was formed and became forceful in its demand for and support to research.

The Period 1960-69

Expansion of the anchoveta accelerated in the fisheries, to reach its peak in 1970; the rate of increase in total production, from 1938 up to 1977, was 16.5 percent, but in the expansionary phase of the fishery, to 1970, the rate was 25.75 percent.

The dangers of such a rate of increase were undoubtedly perceived, at least in some quarters, and the need for research was immediately recognized. With the establishment of the Ministry of Fisheries, an ambitious plan for fisheries development was formulated. Against the background described above, the decision to establish an institute and to seek external aid in its formation was certainly correct. Three marine fisheries projects and two inland fishery projects were executed. The first marine project (from 1960 to 1966) established an institute, under international staff direction, which was converted, in 1964, into a national institute (IMARPE). This project was a resounding success; local staff were thoroughly trained in the techniques of fisheries biology and already-trained personnel (especially those qualified in taxonomy) were recruited to the institute. As indication of the change, the article by Sanchez, referred to above, lists 101 papers published after 1960 of which 84 were by Peruvians and four by Peruvians in collaboration with foreigners; Mugica's article lists 28 post-1960 papers of which six were by Peruvians and one was of joint authorship; a very considerable increase in the first ten years of life of the institute. The synoptic stock monitoring by 'Eureka' multi-ship surveys were established in this first phase and in subsequent phases were further developed in its logistics and in the technical practices in the field and laboratory.

The second project (1967-72) was aimed at strengthening the research on anchovy, extending research to other species, improving statistics and promoting technical changes in the industry. The third project was to continue with these tasks. The first inland fishery project operated for one year, 1972; the second, of two-year duration, began in May 1978.

The projects of this second phase (from 1967) operated in a period of political change in the country and of dramatic events in the industry. As a sequel to the 1968 revolution the anchoveta fishery was nationalized in 1973, but this change was partially reversed in 1977. Considerable investments in fisheries were made, notably with the creation of a major fishing port in Paita. Polish, Soviet and Cuban vessels were granted permission to fish in Peruvian waters and took substantial catches of groundfish. Japanese and Soviet vessels carried out intensive fishery surveys. Various local institutions developed an interest in oceanography (e.g., the Geophysical Institute) and in fisheries biology (e.g., the University of Trujillo). International interest in the El Niño phenomenon and concern for the drop in fishmeal production was considerable; the South Pacific Fisheries Commission promoted discussions of the phenomenon and Unesco and IOC initiated a study programme; IMARPE proposed the establishment of a regional project for monitoring the Peru Current, ERFEN. A major international project for the investigation of upwelling areas concentrated on the Peruvian area in 1975-77. The urgencies of the anchoveta crisis placed heavy demands on IMARPE and the stresses to which it was subject to were aggravated by loss of staff to other agencies and by economic problems which became severe with the country's general economic difficulties in the latter half of the 1970 decade.

In this phase IMARPE, with the assistance of foreign personnel, made considerable advances in its monitoring of the anchoveta, but even in 1975, the staff were soliciting with much force, the provision of training in population dynamics; a course was organized and, while some local staff served as teachers for the course, it was found that in several cases the background in mathematics and in biology was extremely weak.

In 1970 FAO initiated the convening of expert panels to review the results of work on anchoveta and to advise the Minister on management. The last of such panels was convened by the Government itself in 1978.

For the third, marine project arrangements were entered into with the Marine Laboratory, Aberdeen, that it and IMARPE should establish a sister-laboratory relationship under which Aberdeen would make staff available for short-term, well designed and carefully timed assignments, IMARPE staff would visit Aberdeen on fellowships and relations between the two institutes would be maintained, even beyond the end of the project.

At the time of launching the first marine project, the Peruvian situation was one in which the task was expressly to create an institute; at the time of the subsequent projects it was one in which an institute had to be developed further and its research accelerated and re-oriented. IMARPE itself is witness to the success of the first project. The second project had less influence on the evolution of Peruvian research capacity although the Institute certainly made important progress at that time; however, the Institute was then following a routine of investigations more or less automatically and showed few signs of innovative thought and scientific leadership was lacking; moreover, the Institute still lacked the instrument workshops it needed and the arrangements for logistic support to field work continued to be weak. Arrangements for setting priorities and for systematic design and execution of projects were almost non-existent. Some of this ground was covered in the third project. The first inland project had little result and slight effect.

Again, several of the experts left a strong impression of their personality and manner of thought, of enduring effect.

Two special features of the later projects, of strategic significance, were the panels of experts and the sister-laboratory relationship. These are discussed later.

CHILE

Background to 1959

Industry: Also like the Mexican fisheries, those of Chile were well embarked on expansion by 1959; from 1938 to 1959 the rate of increase was 10.8 percent, a rate which predicts the 1976 catch as 1.56 million t, compared with the realized catch of 1.41 million t. Much of the increase of this early period was obtained by exploitation of hake and of anchoveta and sardine of which together, the catch in 1959 was 110 000 t, but the major expansion of the anchoveta fishery did not come until three years later.

Cultural: Chilean interest in natural sciences, biology and related subjects is of long standing. The Scientific Society of Chile was founded in 1891, the Academy of Natural Sciences and the Society of Natural History in 1926 and another Scientific Society in 1946; its Hydrographic Institute of the Navy was founded in 1874 and its Meteorological Bureau in 1884; the National Museum of Natural History was founded in 1830, and other natural history museums in 1879 (Valparaiso), 1912, 1946 and 1955 (Viña del Mar). In 1959 Chile also had the Instituto Científico de Lebu, engaged on research in marine biology and eight universities (one established in 1738, another in 1888), at which research in natural sciences was conducted.

Administrative and Political: Fisheries administration was effected through a Fishing and Hunting Service, but developmental initiatives were taken by the Corporación de Fomento de la Producción (CORFO). F. Melo and N. Carrasco (1975), divided the history of Chilean fisheries into five periods (up to 1953, 1954-65, 1966-71, 1972-73 and 1974 onwards), and described the situation in the first period as being characterized by: (a) lack of information on resource potential; (b) lack of systematic research; (c) lack of a fishery policy; (d) lack of adequate legislation; (e) lack of knowledge and confidence in the industry on the part of private sector. The beginning of the next period, of induced and accelerated development, was marked by a Decree published in 1953 which, supplemented by another Decree in 1960, gave incentives and assistance to development.

Scientific Interest in Living Aquatic Resources and Fisheries: Apart from the research going on in universities, learned societies and museums, the first notable fisheries work was the survey made in 1928-29 by Lubert. In 1941 CORFO brought a trawler from Argentina to initiate trawling experiments and established a trawling company in 1944. In 1944-45 a mission from the US Fish and Wildlife Service, under the leadership of Lobell, made a study of Chilean fisheries at the request of CORFO with a charge to formulate an integral plan for administration, development, utilization and conservation of Chilean fishery resources which would serve as the basis for research, development and expansion to be effected by the duly authorized national organism. Biological studies begun by Poulsen in 1952 and continued by de Buen, first as an FAO expert and later at the University of Chile and finally as Director of the Marine Biological Station of the University of Montemar. A mission of five FAO experts, led by D'Alarcao, in 1957 made an economic analysis of the fishing and processing operations and in its final report proposed a policy which Government might follow in promoting the fishing industry.

The Period 1960-79

The expansionist trend continued, but after passing the million-ton mark in 1964, the catch fluctuated severely; from 1964 to 1977 the average catch was 1.13 million t, but in four years the catch fell well below the million mark; these fluctuations caused a slight deceleration so that the rate of increase over the entire period was 9.1 percent.

The institutional frame developed further in this period, notably with the creation in 1969 of the National Commission for Scientific and Technological Research. In addition, the Chilean Antarctic Institute was formed in 1963 while, of more immediate concern to this study, the Fisheries Biology Station was established in 1961 and the Fishery Development Institute (IFOP) was established in 1963.

This period covers the second half of the second historic period identified by Melo and Carrasco and all the following three periods. Those authors noted that the universities began the preparation of human resources for fisheries in the second period. They characterize the third period (1966-71) by a falling-off in the rate of development that had earlier been achieved and attribute this to overcapitalization of industry; a 40 percent reduction of the anchoveta fleet was thought necessary. They say that the collection of basic research data was improved in this period, although the answers required by the country were still not forthcoming, and that graduates from training centres obtained intermediate level posts while the lack of suitable personnel for principal activities continued. However, there was no lack of trained personnel in industry. In the following period (1972-73) the country lost, they say, its technical management of the sector.

While Chile had had technical assistance from FAO in the 1950s, as noted above, the major contribution[1/] was made in the project which operated from November 1963 until March 1969. The object of this project was to establish, through a permanent Fishery Development Institute, the technical basis for further accelerated development, rational exploitation and utilization of Chilean fishery resources and at the same time to stimulate and coordinate the related activities accomplished by other centres. The charter of the project and hence of the Institute, was broad, covering all aspects of the industry and all phases of the establishment of research and development capability.

Resources research had a major part in the plan of work in the project, but since it occupied only 39 percent of expert time, the project is by no means to be seen as concerned with the formation only of a resources research institute. Of the national personnel, about the same proportion (42 percent) were directly concerned with natural resources. These facts and the fact that the project was led by a technologist, must be taken into account in any attempt to appraise the strategy adopted for this project and to assess its effects on Chilean resources research. I must stress that, in making this observation, I make no reflection whatsoever on Mr Moreno's capacity to administer a project or on the manner in which he executed his duties. However, it is an open question whether the combination of resources research with technological and economic research in the one institute is a good arrangement; this is

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[1/] Mention should be made of the Latin American Training Centre on Marine Resources Appraisal, held in Chile in September/October, 1966 a question to which an answer will not be found simply in an examination of the compatibility of the respective paradigms of research, but in many other matters such as national administrative practices in formulation and execution of policy, in setting priorities and in allocating resources, as well as national traditions in the direction and conduct of research and in the processes (especially in industry) that lead to the formulation of demands for research results.

Nevertheless, the advisability of establishing a fisheries research institute in Chile can hardly be questioned and the move to do so, in 1961, was opportune.

ARGENTINA

Background to 1959

Industry: In contrast to the fisheries of the countries considered so far, those of Argentina had a rate of increase of only 5.8 percent, a rate which, be it noted, was maintained until the late 1970s. Angelescu (1963) had noted the parallelism between the growth of the population and the increase in total catch, resulting in a more or less constant rate of consumption per caput. No doubt the explanation commonly offered, that fisheries development offered no attraction to investors because meat was abundantly available, is adequate, but it is to be borne in mind that Argentina was, and still is in some degree, with its back to the sea because of the economic and cultural significance of the pampa.

Cultural: Argentina is well endowed with scientific bodies and was already so in 1959. Three academies (founded respectively in 1869, 1874 and 1937) and three associations (1872, 1911 and 1920) devoted to natural sciences gave support to biological research. Research was carried out and supported by the Miguel Lillo Foundation (1931), the Buenos Aires Scientific Research Commission (1956) and the National Council of Scientific and Technical Research (1958). The Hydrobiology Station (1928) and the Bella Vista Research Centre (1954) were directly concerned with marine sciences and fisheries. In addition there were 17 universities, one founded in 1613 and two in the 19th Century.

Administrative and Political: The Dirección General de Pesca y Conservación de la Fauna, Secretaría de Agricultura y Ganadería was responsible for fisheries administration; it had a department of Fishery Research which assembled fishery statistics (quantity and value of catch, by species) collected, in the main, by the Prefectura Nacional Marítima.

Scientific Interest in Living Aquatic Resources and Fisheries: Active interest in oceanography and marine biology was maintained by the Servicio Hidrográfico Naval, Secretaría Marina, through the Instituto Oceanográfico Argentino, by the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" and by the Instituto Nacional de Investigación de las Ciencias Naturales (Ministerio de Educación). The first of these supported Angelescu's work and published his reports. The latter two published the work by Popovici and Angelescu (1954) and had a major role in the conduct of the First National Congress of Marine Fisheries and Related Industries; although the papers of that Congress had little of interest concerning resources, the extensive array of resolutions adopted shows that the Congress ranged widely over most of the problems of fisheries of that time. The interest in marine sciences on the part of the universities led to their joining forces in establishing the Instituto de Biología Marina in 1964. Angelescu (1977), in a review of the evolution of fisheries biology in Argentina identified four 'phases' of which the first occupied the years 1954-59. According to him, fisheries biological research in Argentina began with the conduct of regular oceanographic cruises of the "Operation Hake", in 1954-56, but marine biology and oceanography had earlier beginnings as is shown at least by the founding of the Hydrobiology Station in 1928, and of the Argentine Antarctic Institute in 1951. Angelescu makes no mention, in the review referred to, of the part played by Popovici at this time when they laid much of the foundations of Argentinian oceanography and fisheries biology.

The Period 1960-79

As remarked above, the relatively low rate of increase of the catch began before the 1940s and continued until towards the end of this period. But events elsewhere in the world, with expansion of the market for fish simultaneously with difficulties in maintaining supplies as overfishing effects appeared in one stock after another and above all as major small pelagic fish stocks collapsed, directed attention once more on the riches of the Patagonian Shelf and on the grounds off the mouth of the Río de La Plata. The activities of foreign vessels in the Southwest Atlantic, with the debates in the UNCLOS meetings and the negotiations and discussions with regard to the Antarctic were perhaps the major determinants that led to the Government perceiving the diplomatic, economic and other advantages of having a more substantial Argentinian industrial and research presence in these waters.

One important result was the signing of the Treaty of the Río de La Plata with Uruguay, and the formation of the Joint Technical Commission and establishment of the common fishing zone off the mouth of the Río de La Plata. Another was the invitation to Japan and the Federal Republic of Germany to carry out research on the Patagonian and Buenos Aires shelf.

These are major features of this period, seeing it at a glance, which must be kept in mind when examining detail of resources research.

In Angelescu's review of the history of Argentinian fisheries biology, the period 1960-77 was filled by three 'phases' of development: (a) of regular biostatistical sampling which began with the establishment, in 1960, of the Inter-University Marine Biological Institute of Mar del Plata (this later became the present INIDEP); (b) of fishery oceanographic, exploratory fishing and experimental fishing cruises of the UNDP/FAO Project from 1966 to 1974, and (c) of cruises by foreign fishery research vessels and of commercial fishing by foreign vessels, from June 1966 to January 1977. (The last phase in fact continued well into 1979, especially with joint meetings to review and interpret the results.)

The last two of these 'phases' had continuity in the Institute at Mar del Plata which, after 1976, became the present National Institute for Fisheries Research and Development (INIDEP) and had an important unchanged component of personnel.

During this period there was also a considerable increase in interest in marine science on the part of Government agencies, of universities and institutes.

Especial notice must be taken of the work of CARPAS whose general sessions and working party meetings did much to promote exchanges between Southwest Atlantic countries.

The major aid programme was the UNDP/FAO Project which operated first from 1966 for five years and then was extended for a further two years. In addition, Argentina was host (in 1971) to a training centre in acoustic methods for the detection of fishes and estimation of their abundance and shared three projects with Uruguay and Brazil, one from 1960 to 1964 to advise the Governments on research on marine fishery resources, the second from 1960 to 1964 concerned with exploratory fishing, the third from 1961 to 1962 dedicated to research on shrimp resources. Also it had a short-term project in fishery statistics in 1973.

Since regular biostatistical sampling had been in progress for several years just before the Project began, it cannot be thought that the Project introduced these practices to Argentina; nevertheless a considerable amount of work was done under the aegis of the Project. The provision of a research vessel was of especial effect; because of its availability much was added to knowledge of merluza, anchoita, caballa and other species in the course of extensive field work. Of especial importance was the work on eggs and larvae. The Project staff, notably Aasen, left a deep mark of discipline and reliability on work practices.

URUGUAY

Background to 1959

Industry: The statistical record indicates that Uruguayan fisheries remained stagnant up to 1963, with an average catch over 26 years of about 4 500 t, exceeding 6 000 t only in three years.

Cultural: As a very small country, Uruguay has relatively few institutions of any kind concerned with marine sciences and related subjects. In 1959 it had a malacological society, the Clemente Estable Institute of Biological Research (1927), and the National Museum of National History (1837); it was host to the Unesco Regional Office for Science and Technology in Latin America and the Caribbean and it had an Oceanographic and Fishery Service (1945).

Administrative and Political: The Servicio Oceanográfico y de Pesca (SOYP) was established in 1911. In addition to being responsible for fisheries administration and maintaining a Scientific Department to which Fernando de Buen was adviser in the 1940s, SOYP undertook industrial activity to such an extent that Luna (1964) remarked that SOYP with its fleet of vessels constituted the bulk of the Uruguayan fishing industry at the beginning of the 1960s.

Scientific Interest in Living Aquatic Resources and Fisheries: An interest in fisheries was maintained by the Veterinary Faculty of the University through its Instituto de Investigaciones Pesqueras, but this was largely a technological interest. In 1949 the Humanities and Sciences Faculty of the University nominated de Buen to represent it at the Santiago Congress of 1949.

The Period 1960-79

From an average of about 4 500 t, the catch (according to statistical record) jumped in 1964 to 12 200 t and over the next ten years averaged 14 250 t; then in 1975 jumped again to 26 300 t and averaged about 57 500 t up to (and including) 1979. In each of the three periods the rate of increase was about 3.5 percent, but with the discontinuities the overall rate of increase from 1938 was 8.1 percent.

A National Fishery Board (JNP) was formed in 1972, to advise the Minister for Industry and Commerce; in 1974 responsibility for fisheries was transferred to a Ministry of Agriculture and Fisheries and in 1975 the National Fishery Institute (INAPE) was created and took the place of the National Fishery Board.

In terms of the number of projects, related to the magnitude of its industry and resources, Uruguay has been a much assisted country in the field of fisheries. It shared three projects with Brazil and Argentina and received a substantial report proposing a fishery development programme prepared by an FAO economist in the period 1960-64. Its staff participated in the Acoustics Centre in Argentina in 1971. A major project operated from May 1972 until December 1978.

The small group of resources research workers now in INAPE owe much to the training they got when working with project staff, especially with Erhardt.

VENEZUELA

Background to 1959

Industry: Like Uruguay and Argentina, Venezuela has a history of relatively slow development of its fisheries. Over the entire period 1938-77, the rate of increase in catch was 3.9 percent; the regression line, with $R^2 = 0.82$, fits the recorded data well. The fisheries were essentially artisanal until the initiation of the shrimp fisheries in the early 1950s.

Cultural: The Academy of Sciences was founded in 1917 and the Venezuelan Association for the Advancement of Science in 1950. The "La Salle" Society of Natural Sciences was founded in 1940, and a foundation of the same name in 1957. The Venezuelan Society of Natural Sciences was founded in 1931, the Venezuelan Institute of Scientific Research in 1959 and the Juan Cagigal Naval Observatory in 1890, the Natural Sciences Museum in 1940. Two universities had been established in the 18th Century, one in the 19th Century and ten others in the 20th Century. Thus by 1959, Venezuela already had a substantial array of learned societies and institutions for training research workers and supporting research programmes.

Administrative and Political: Whilst administrative responsibility for fisheries lay with the Ministry of Agriculture and Animal Husbandry (MAC) many other Government Departments and agencies maintained an interest in the industry. A US mission made a study of Venezuelan fisheries in 1941, chiefly with a view to increasing production of saltfish.

Scientific Interest in Living Aquatic Resources and Fisheries: Probably the forces of most effect in this period were the "La Salle" Society and Foundation and the Navy, together with universities, especially the Universidad del Oriente.

The Period 1960-70

With further expansion of the shrimp fishing operations, signs of overfishing appeared in the fishery of the western zone; interference with the habitat in Lake Maracaibo probably contributed to the changes. Some of the boats moved to other sectors and this coincided with the development of trawl fishing which eventually came into conflict with the artisanal fisheries. Despite these difficulties, the catch continued its steady rate of increase.

There was a flowering of interest in the fisheries in this period. Altogether 17 different initiatives, by way of studies, plans and meetings were taken in the period 1965-78. As an indication of the change, a comprehensive (although still incomplete) bibliography compiled at the end of 1978 listed 970 papers, of which 116 appeared before 1959, 370 in the period 1960-69 and 475 in the last eight years.

The major fisheries assistance given to Venezuela was the project known as MAC/FAO, which operated for five years from 1967. Before that it had had technical assistance experts in the late 1950s and the early 1960s and subsequently it has had a two-year project which is only now drawing close to conclusion.

The MAC/FAO Project was substantial and covered all aspects of fisheries work; it was not limited to resources research although that occupied a large proportion of its resources and its director was a fisheries biologist (he still is). The project had a substantial output of papers and many research workers got their substantive training for fisheries work in the Project. At its termination, the Project had an apparatus of trained personnel and equipment eminently suitable to continue as the permanent organization for fisheries research, intelligence and development promotion. Unfortunately, this was dismantled, equipment and records dispersed, the library pillaged and the staff reduced by resignations and transfers. The official research capability was reduced very greatly, but several of the more important researchers were able to continue work with private enterprises, universities and other agencies.

GENERAL

The foregoing 'country' sections give a brief and very condensed account of the background to FAO's aid-in-research projects in the selected countries and, in each case, a summary appraisal of project accomplishments[1]. The results of this work are further summarized in Table 3, in which each column corresponds to an item of the terms of reference given by the Working Party. A response to each of the terms of reference can be attempted against this summary.

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[1] The appraisals are admittedly subjective, even personal, and certainly qualitative. The material of each section is derived from a reading of project documents and local scientific papers, from discussions with many people and from direct project experience in three cases. A deeper study would have included an analysis of project progress reports and of reports of evaluation missions, but there was not time to do so

With regard to contribution to knowledge of resources, it can be said without hesitation that the projects were associated with, contributed significantly to and produced much effective research which resulted in valuable additions to the knowledge of the resources of these countries. But clearly that is not enough: as much would have to be said about the work of any group of scientists; and after all, the projects cost a lot of money, running into millions of dollars and occupying a great deal of time - probably well in excess of a thousand man-years by a loose definition of project involvement and certainly several hundred man-years by a strict definition of expert and counterpart involvement. Some further questions have therefore to be asked.

First, was the output adequate in volume, considering the costs in time and money? Second, was its quality satisfactory? And third, was it appropriate to the problems confronted by industry and administration in each case? Here we approach the kernel of the matter (la medula, as it is said in Spanish). It would be inappropriate to offer a firm and absolute judgement with respect to the first two questions without: (a) having an agreement on criteria of performance, with clear specification of inputs required for each level; (b) taking due account of the state of the science at the time, and (c) making appropriate allowance for the conditions under which the work was performed. Nevertheless, in a qualitative way the following can be said. The reports and papers were of a number and level such as could be expected at the time and under the circumstances. In general, the work was convergent research within the current paradigm, largely preoccupied with the numbers game. Stock composition, values of various specific characteristics and of the constants of familiar equations, were some of the matters to which much time was devoted; valuable additions to the general stock of knowledge, but probably not original contributions to theory or the understanding of these systems. But it is to be remembered that each research worker (local or foreign) had to devote a substantial proportion of his time to immediate tasks of organizing and maintaining routines for obtaining catch and effort statistics, sampling catches, carrying out work at sea, laboratory analyses and data processing. Even this work was impeded and often frustrated by bureaucratic problems of budget and of customs clearance, a lack of workshops and other technical services and staffing difficulties. Perhaps the conclusion should be that it is gratifying that so much was accomplished in spite of such difficulties.

With regard to the third question - concerning the appropriateness of the results - some answer can perhaps be got by turning to the second of the Working Party terms of reference (Column 3 of Table 3). As can be seen from the table, it is my view that only in the case of the Peruvian projects, can it be said that a contribution was made to securing the use of research results in development and management of the fisheries. The Peruvian Government certainly gave much attention to research results and to the advice given by IMARPE and the Panels, even if, at times, it did not act strictly in accordance with that advice. It is a fair conclusion that the projects contributed much to making the Government aware of the nature of resources research and of the value of its results. If the research work failed to predict the onset of the El Niño conditions and the consequences of the conjunction of those conditions with the exceedingly heavy rate of exploitation and, later, could not design a strategy to meet the events from 1976 onwards, it was because of the state of the sciences (meteorology, oceanography and fisheries biology), rather than because of any characteristic of the projects and the local institute. However, perhaps some charge lies upon the projects with regard to the research paradigm and I return to this point in connexion with the third term of reference.

Table 3

Country	Knowledge of Resources	Use of Information in Development and Management	Research Capability and Creation of Institutions	Research Facilities
Argentina	Numerous reports with much new information on biology, distribution, abundance and environment of merluza, anchoita, caballa and other species	Of little effect	Many persons acquired or increased their skills in ship-board and laboratory practices; Institute's competence was enlarged	Provision of a research vessel was of critical importance otherwise project contributed little
Chile	Additions to knowledge of resources of central and northern waters and their environment	Of little effect	Training given chiefly in populations research	
Mexico	Some small contributions on shrimp and its by-catch, on other species notably clupeoids and demersal spp. of Gulf of California	Of little effect	Many people had opportunity to gain experience in oceanographic and biological practices and to enlarge their understanding of theory	A boat was provided, and operated extensively on sardine research; a mini-computer was installed
Peru	Considerable additions were made to knowledge of anchoveta and its environment	Extensive and effective participation in management of the anchoveta fishery especially after the fall in catch	IMARPE came into existence by assimilation and enlargement of the entity created by the project; many people received their research training in the course of the project	A boat, much equipment and literature were provided
Uruguay	Some addition to knowledge of distribution and biomass of merluza and anchoita and other species	Of little effect	A few people trained in stock assessment calculations	A boat was provided; also a mini-computer
Venezuela	A substantial set of publications were produced adding a wide range of items of information regarding several resources and their environment	Of little effect	Many people received training in the course of the project	Much equipment and literature was provided

The need to conclude, with regard to the other five projects, that the work had little effect on development and management, derived from a consideration of events in the industries of these countries during the past ten years and of various Government actions and pronouncements. I know of no case of the course of industrial development having been changed in consequence of taking research results into account or of official views of industrial prospects having been modified in the light of such results. The conclusion may be erroneous; the matter certainly merits closer study. But supposing the conclusion to be correct, it does not then necessarily follow, that the research was inappropriate. Governments, often for their own reasons, neglect research results and industry is often unable, for economic, technical or other reasons, to take advantage of them. Nevertheless a deeper study would almost certainly show: (a) that some of the research activities were less appropriate than others that might have been undertaken, and (b) that some projects lacked the means to promote an understanding in governmental and industrial circles of the nature of the research results and of the ways in which those results might have been applied.

These conclusions, with regard to scientific output and to application of results, must be subject to what can be said in response to the third term of reference, concerning the strengthening (or creation) of institutions and enlargement of research capability.

Before passing on to the other terms of reference, I wish to emphasize that in considering scientific output, above, I have endeavoured to avoid attributing results exclusively to projects or to foreign personnel. At its simplest, some project report series include papers reporting work carried out entirely by personnel (of the institute in which the project was lodged) who had no connexion with the project; the only contribution by the project to such work was to provide a medium of publication. Beyond this, as is the case of most stock evaluation work, each report deals with material obtained by the efforts of many people; not only is the contribution of technicians and others not shown in authorship, but it is often the case, in these projects, that reported work had substantial support from institutional elements which, properly speaking, were not part of the project. Finally, it has always to be kept in mind that foreign personnel are strategically placed to take advantage of situations which are favourable by historical accident, of which, had the foreign staff not been present, local staff might have taken advantage.

Turning now to the third term of reference, again it must be said at once that, yes, many people, as counterparts, obtained training from experts and from training centres and fellowships. Again that evaluation must be subjected to the deeper analysis of the three questions asked with regard to scientific output, as to quantity, quality and appropriateness, and once more one must insist that quantitative, absolute measurement is now impossible. It is impossible, for reasons expounded in the introduction, to assess even how much the national competence for resources research changed during the time of each project, let alone to measure the part that the foreign experts and the project activities might have had in promoting that change. Even a statistical analysis of the number of scientific papers and reports, from the project, divided into three classes - solely foreign authorship, solely local authorship, and combined authorship - will not yield a satisfactory index; too many other influences intervene in the determination of authorship: a very low proportion of papers bearing local names might reflect the anxiety of foreign personnel to advance their own career and conceal the fact that, nevertheless, local staff had been very successfully trained.

Accepting that a quantitative evaluation is impossible, one must fall back on a quantitative appraisal. While repeating and emphasizing that many counterparts gained a great deal from the projects, with permanent effect in their countries' fishery programmes, one has nevertheless to consider the situation of those trained people, the state of the institutions the projects were to assist, the investigative power of current programmes and the influence that these programmes can exert on development and management. With regard to personnel: many trained people had to change their occupation, others sought employment in other institutions, of their own country in some cases, in other cases in other countries. In other words, the situation at the termination of some projects was not such that the trained people constituted an integrated group lodged in a firm institutional setting in which they could continue the work for which they were trained. In one case the institutional complex was effectively dismantled and within a couple of years neither an institution for fisheries research nor a research programme existed in the country. In another case, the institution existed in name, but very little work was in progress; in another case a relatively large group of people were engaged in trivial activities. Obviously, in such cases the possibility of influencing development and management is minimal. In the other cases, in which research is indeed in progress, serious questions must nevertheless be raised as to the effectiveness of procedures for planning and directing research, and to the appropriateness of the research being undertaken.

Here we are concerned with the larger, institutional aspects of the aid in research programmes. It is all very well to train people how to take plankton samples, to collect samples of fish to be measured and examined as to reproductive state, to compile stock composition tables and to calculate the constants of the von Bertalanffy equation. But such work is effective only if conducted systematically toward the operation of appropriate models and it cannot be carried out in this manner if facilities, services and funds are inadequate and even less can be done if the institution is non-existent.

The two aspects of this matter are of the institution and of the programme. The creation of a national research institute and its maintenance, with due support to the discharge of its proper functions, are matters of political and administrative decision in which an aid agency and its field personnel have little part and on which they can exercise influence only by consent of the Government. Nevertheless, however slight may be the possibility of exercising some influence on these decisions, each aid in research operation should include activities aimed at bringing to the attention of the responsible authorities, the evidence relevant to these decisions and at assisting in an interpretation of that evidence in the light of local circumstances. The groundwork for these activities should be established through the D/P procedures and further support should be drawn from success in the conduct of relevant research.

The most convincing argument in favour of support for a research institute is evidence that application of its results have brought important economic, social and administrative benefits; the road to that result is by way of arrangements to concentrate available research capacity on matters of greatest importance, with most real prospects of early and effective application and to conduct the work efficiently and rapidly. Yet it seems to me that it is precisely the lack of such arrangements that is perhaps the outstanding common characteristic of the institutes under consideration in this study (bearing in mind that the research set up in one case scarcely merited the designation institute). In general, research is carried out by disciplines, independently and without integration or orientation to identified major problems. It seems that the projects successfully contributed to a grafting of stock-analysis techniques onto a background of general biology, but did not, for whatever might be the reason, implant a general concept of ecosystems and the dynamic relations that hold between exploited stocks and the systems to which they belong. Thus, the prevailing idea of a fisheries research institute is that it is a place where one engages, according to one's inclination and training, in plankton research, or taxonomy, or fish biology, or perhaps even in population dynamics. There has thus been a deficiency in individual training, leaving each student without a clear idea of how the work in which he wishes to engage should integrate with the work of others; and a deficiency of training at more advanced levels where these relations should be well understood and provided for in the programming of research.

I would identify one important cause of this situation and one important consequence of it. The cause lies in major part, I believe, in the 'territoriality' of some fishery workers, expressed in an attitude that fishery matters belong exclusively to fishery workers and, at the international level, to FAO to the exclusion of Unesco. From this attitude has come the rivalry and non-cooperation between FAO and Unesco. As a consequence, FAO projects have not had the benefit they could have got from Unesco projects conducted as a complement; the Unesco projects could have done much to implant the broad ideas of ecosystems and to ensure a supply of graduates prepared to take part in integrated programmes.

From the situation I describe and from the attitude which I believe to be its major cause, comes the consequence that research leadership is lacking.

The experience in these countries has shown, I believe, and subject to the reservation I make below, that there was and perhaps still is a need for two kinds of promotional activities in connexion with aid in research programmes. One would be directed to administrators and especially to the staff of central planning authorities, to give them an understanding of the nature and benefits of resources research in connexion with fisheries development and management. The other would be directed to senior research workers and those in charge of research institutions to give them competence in D/P procedures and in the planning, programming and direction of research.

Having said all that, I must point out that I have avoided the perhaps delicate subject of national politics (as distinct from policies) and the effects that political situations have had. In two cases many of the features of the situation I have described had their origin in abrupt administrative changes which gave play to strong internal rivalries. In two other cases, very serious political disturbances had much effect. While an aid agency cannot do anything about matters of this kind, in themselves, I see little evidence of serious thought, having been given to anticipating the events or coping with their consequences other than by ad hoc emergency measures.

Turning finally to the fourth term of reference, concerning institution facilities, I suppose that the major determinant of action in this regard was limitation on funds available, but in general, the impression I have is of lack of professionalism. An item of critical importance, in each case, was the provision of a research vessel, but in few cases was the vessel operated at acceptable levels of efficiency. Much more attention should have been paid, even at the expense of other items of a project, to obtaining proper governmental support to vessel operations and to training people in the planning and conduct of sea-going work. Equipment for data processing was provided in most cases, but it was not fully professional equipment with the capacity necessary for the work that was being undertaken. A major gap, of very serious consequences, concerned workshops. Only minor budgetary provision was made for the acquisition of tools and machines and, as far as I am aware, none at all for the training of workshop technicians. Assistance with regard to library and to editorial work also was inadequate.

DISCUSSION

The central piece of an aid-in-research project is the complement of 'experts' appropriately linked to a set of counterparts. This has been the typical arrangement in science, classically, since its beginning, as indeed it is of most transmission of culture. Through this relationship information is imparted, ideas are generated, techniques are developed, research is carried out and results obtained. In this situation counterparts receive on-the-job training and, if they are fortunate in their 'expert', become accustomed to the giving and taking of criticism, acquire orderly habits of mind and learn discipline in the examination of evidence. The provision of equipment is chiefly a means of facilitating the operation of this relationship, although it is of very special effect when the equipment is a ship; the granting of fellowships is a strategic means of accelerating particular learning processes.

Whilst it is obvious that much of the success of such a relationship derives from quality of the 'expert' and his suitability for the situation to which he is assigned, the quality and suitability of counterparts is perhaps of greater importance; and both sides are subject to the context in which they find themselves.

This review of Latin American experience has not uncovered any evidence to suggest that an alternative can be found to this arrangement; if anything, it has reinforced the conclusion that the principles enunciated in the previous paragraphs hold for any one of the kinds of activity listed on Page 136, and for any combination of them. It might be thought that they do not apply in the case of an 'expert' appointed to advise on activities (a) and (d) when the person to receive the advice is a high functionary, say a Minister, who might expect to receive the advice and decide himself whether to act on it. The argument would be that in such a case the expert must work in vacuo, as it were, but it is inconceivable that an 'expert' would formulate advice without some study of the situation or could do so without some collaboration with local personnel, in what would be virtually an 'expert'-counterpart relationship.

The alternatives then for betterment of aid-in-research strategies, lie not in finding different agencies of aid or different activities for them, but in the design of projects and in the procedures for their design, organization, execution, monitoring and evaluation. Before examining this proposition in detail, the two features of later Peruvian projects, mentioned on Page 151 must be discussed.

Although at first sight the panel-of-experts scheme seems an admirable arrangement, it can be unobjectionable only by most careful organization. However well-intentioned may be an offer to convene such a panel, aimed at obtaining rapid and effective utilization of all available information, it can scarcely avoid giving the impression that local staff have been judged to be incompetent, unable to carry their work through to its proper conclusion; they cannot even take consolation in a pretence that this is a matter no more than of higher authority asking for a "second opinion". While the staff of a young institute might welcome a panel meeting as a form of training and as an opportunity to obtain guidance in their work, the staff of a well advanced institute are likely to resent the proceedings, especially if they participate chiefly as 'witnesses' and are given little or no part in the deliberations from which conclusions emerge. Two alternatives could be considered: one would be to make the work which is to be reviewed, the subject of an international meeting at which local staff would present and defend experience papers while invited speakers (not all of whom need to be foreign) would present subject or methodological papers; the other would be to organize a review meeting of local staff and obtain the services of some specialists to deal with particular aspects which the research workers themselves might nominate, because of feelings of uncertainty, or which the director of the institute might nominate because he considered his staff weak on those aspects, and had told them of his view. Still another possibility exists, and it is probably the best of all, namely the presentation of results at a meeting of a regional fisheries body.

The sister-institution arrangement was proposed as a means of improving the recruitment of specialist staff for a project and of giving greater extension to the effect of each specialist. Consultations between the directors of the institutes would mean that the director of the 'elder' institute, from his knowledge of problems in the 'junior' institute, could more accurately nominate the members of his staff most suitable for required tasks. With movement of research workers back and forth, the staff of the 'elder' institute would develop a common understanding of the situation of the other institute and this effect would be enhanced by the presence of fellows from the 'junior' institute. Fellows would arrive at an institute not entirely unfamiliar to them; some of them would arrive to work with the 'experts' with whom they had been working in their own laboratories. A sense of common responsibility would develop. Furthermore, the arrangement offers a means of gaining access to a wider range of expertise for this work; a specialist who may be reluctant to absent himself from his laboratory for a year or more may be willing to devote a month or two of each year to a well-defined task for which arrangements had been carefully made. The idea is not new; arrangements such as this have developed informally in a number of cases but, as far as I know, have not often been formally and systematically developed.

In considering the matter of alternatives the discussion might be arranged under five headings:

Project design
'Experts', their recruitment and placement
Project execution and monitoring
Project evaluation
Strategies generally

but although particular and distinct items appear under each of these headings, each aid opportunity involves, I believe, a fundamental choice, the result of which has major consequences to the matters to be considered under the above headings. This choice is between what I call problem-oriented strategies and objective-oriented strategies, both terms relating to the system to be assisted. The distinction between the two can be visualized by reference to Figures 1 and 2 of this paper: objective-oriented strategies are plans formulated with a view to achievement of a result X; problem-oriented strategies are plans to resolve difficulties identified along the sequence of steps by which a nominated result may be achieved. In my view, an objective-oriented strategy is inappropriate for aid-in-research. It is likely to be politically attractive since objectives are always things or states thought to be better than those already existing and therefore meeting with general approval; but therein lies the operational disability of the approach. If one thinks of Figure 2 repeated in a more complex figure with a series of results X_1, X_2, etc., which, in separate sets, lead to other results Y_1, Y_2, etc., which in turn lead to a main result Z; and suppose that result Z stands for improved nutritional standards of the population generally, or improved living conditions for fishermen; then, since Z meets with approval on all sides, any sequence of steps leading to X_1, X_2, etc., can be 'justified' because it is directed toward Z. But, by this criterion (of being oriented to the main result Z), all sequences have the same importance. Effective discrimination between the sequences can be made only by identification of the problems that lie with respect to the results Y, or before them with the results X.

Again, since the objective of all research is new information and enlarged understanding, a project is not to be justified, nor can it be given priority, on this ground alone. Discrimination between projects is to be effected by consideration of the importance of the problems to whose solution the research results will make a contribution and of matters such as the prospects of effective application of the results and the costs of executing each project. While an aid-in-research programme can assist in an identification of the problems for which research is required and in putting these into an order of priority, its central focus is upon the research system itself and upon the obstacles that stand in the way of effective conduct of research. Decisions within a research system relate to the alternative means of realizing the activities of approved projects. In reality the problems lie with the competence of staff, the adequacy of services, the availability of workshop assistance and with practical matters of this kind which are not apparent in high-sounding declarations of the importance of estimating the size of stocks or of avoiding overfishing.

An aid-in-research programme has the following phases:

1. Identification of industry problems requiring information which research can supply;
2. Identification of obstacles to research;
3. Design and execution of project;
4. Review, as at 1 and 2, of the situation at termination of the project.

The first of these phases is a matter of diagnosis and prognosis (D/P). A person with experience in the planning and direction of research should participate in each D/P exercise, not solely for the purpose of assisting in identifying the information needs and thereby specifying the research tasks, but also of surveying the conditions under which research is carried out. The latter involves, in particular, an examination of Government policy with respect to science in general and to fisheries research.

In the second phase, the research tasks being identified, a study must be made of existing research facilities and capability. This again is work for a person with experience in planning and directing research, and in most cases will be done most effectively, expeditiously and economically by the research member of the D/P team. The work in this phase should provide all the information necessary for designing a project.

These two phases are of critical importance and have special technical significance for an aid agency. The work to be carried out in them requires the attention of analysts qualified in the separate fishery fields (resources, boats, gears, processing, manpower, etc.); it is not an administrative activity. In the case of fisheries, the first phase calls for close collaboration between the technical divisions and the second phase calls for collaboration with Unesco and perhaps other agencies.

The third phase divides into a number of sub-phases. The first of these is that in which a technical design of the project is prepared (preferably by the research member of the D/P team) and a translation is made of it into operational-administrative terms. These two operations belong to the one phase because the end result is a single document, with title "Plan of Operations", or something of the sort, presenting a description of the project in technical, logistic and financial terms, supported by an appropriate statement of justification. The realization of this document is almost always an iterative process, of adjustment of technical detail and financial calculations, which necessarily requires collaboration between technical and administrative personnel.

There follows a sub-phase of negotiation whose termination is either an approval or a rejection of the project, but approval may be made subject to some further modification of the plan of work, either directly in technical detail or indirectly through some change in the funds available for the project.

Next follows the sub-phase of project execution which has its own particular sub-phases, according to the plan of work.

Considerable operation advantage would be gained from setting out a work plan with three separate, but closely connected and coordinated components concerning, respectively:

(a) the planning, programming and conduct of research;

(b) training;

(c) the organization, maintenance and operation of facilities.

In the second phase of the programme (identification of obstacles to research), a measure will have been made of the existing level of competence and hence of the required training load to be carried by experts, training centres or fellowship arrangements; particular attention will also have been paid to the state of the available facilities and a tentative programme will have been drawn up for their improvement. The timetable for execution of project activities would be prepared with due regard for the true characteristics of the local situation.

CONCLUSIONS

The main conclusion that emerges, for me, from this study is that we have conducted these projects rather amateurishly - not that any scientist has been amateurish in his research, but that the design, organization and conduct of projects to assist countries to acquire and develop the capability for effective fisheries research, has lacked the professionalism required. Too little importance was paid:

(a) to understand the political and economic status of the industry our work was supposed to help;

(b) to understand the national (cultural) and governmental (political) attitudes to science in general and to fisheries research in particular;

(c) to analyse and appraise the fishery research situation in each case, in terms; first, of what we learnt from (a) and (b); second, of practical matters such as workshop facilities; third, of levels of competence; fourth, of abilities to plan and direct research;

(d) to design projects, on the basis of all the foregoing, to include:

  (i) effective planning;
  (ii) consultation with industry;
  (iii) promotion of a comprehension and understanding on the part of administration;
  (iv) inter-cultural and inter-disciplinary exchange with the collaboration of Unesco.

Continuity is a characteristic of fundamental importance to whose establishment much of the effort of an aid-in-research project should be directed. Continuity is required in the formulation and execution of policy and in planning, programming and executing research projects; such continuities imply continuity of personnel, especially of leadership. Some break of continuity is unavoidable: governments change and new governments adopt new policies; key personnel resign or retire. However, the likelihood of such changes is not a reason to abandon the effort to maintain continuity; it is, on the contrary, a reason for even greater efforts.

In research itself, continuity should be sought not only to the completion of each project of defined objectives but also to the initiation of successor projects appropriate to new situations existing upon completion of original projects. In this sense we see a need, for each resource system for a sequence of research activities, from the primary phase of resource identification and specification of distribution, through life-history studies, and population structure and dynamics, to deep analysis of ecotic relations and development of prediction systems - even if some minor resources do not warrant the execution of the complete sequence. And we see the evolution of an institute which calls for aid in research as passing through a corresponding sequence, with progressive acquisition of capacities to undertake research which, year by year, becomes more complicated and more sophisticated.

It then follows, quite obviously we believe, that the aid-in-research techniques themselves must change, to correspond in each period to the kinds of projects in execution and to the level of competence of the staff of the assisted institute. Each aid-in-research project should be designed to provide aid appropriate to the period in which it operates and to prepare the way for a successor project.

In order to observe this principle, FAO's planning unit would have to seek to promote, in each country to which aid-in-research is to be given, the formulation of a long-term plan for the evolution of effective research and for the corresponding evolution of research capability. This country plan would be matched by a sketch of an aid plan, comprising a series of projects.

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* For all bibliographic references with an asterisk, it has not been possible to find the original publication and, therefore, to check whether the references provided by the author were given according to the FAO standards

LIST OF MEETINGS

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ANNEX 9

Development or Economic Growth?

by

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There has been a silent revolution in the social sciences since the early sixties. Whereas in the previous period quantitative indices had been treated as a sufficient measure of social progress or growth, since the Second World War experience from developing countries has shown that the equation is probably unwarranted. Growth can occur without any significant 'spill-over' to all sections of society, unlike what happened in Europe. The problem of social access, as against physical accumulation, has to be confronted. The transition from positive economics or social science to normative development theory has not been easy, nor has it been free of controversy. All the same, "development theory" has become a reality and is beginning to make itself felt even in the natural sciences. This has been made even easier by the epistemological break in the philosophy of science which was signalled by the work of Thomas Kuhn[1/]. In that work Kuhn, a mathematician and theoretical physicist, argued that ultimately the explanation for change in scientific paradigms is to be found in social or psychological factors, and not in simple accretions of physical knowledge. It would seem, therefore, that 'development theory' is not mistaken in re-introducing some of these anthropological questions - development for what, for whom and by whom?

At first sight the physical sciences seem to be immune to such questions. And yet not so, for, as Kuhn suggests, means have to be related to socially defined goals or objectives. While science has a very high degree of transferability across cultural borders, the uses to which science is put are locally determined. Implicit in this statement are a number of presuppositions, regarding the generation and diffusion of scientific knowledge. The share of developing countries in the generation of scientific knowledge is estimated to be around three percent. In the meantime, it is fairly certain that the actual consumption of or the need for scientific knowledge in these countries far exceeds what they themselves can provide. Therefore, they are obliged to import scientific capacity as well as technology. In practice this has proved to be an intractable problem, as is shown by the existence of a variety of 'theories' of transfer of technology, of 'intermediate' or, more recently, of 'appropriate' technology. These are indicative of a persistent quest for certainty in a situation where what was taken for granted in Europe is hardly realizable in developing countries.

While machines or technical equipment can be transferred from one country to another, under certain conditions, it does not seem that their effectiveness in alien socio-cultural environments can be taken for granted. Probably this was one of the weaknesses of theories of diffusion of innovations. They were naturalistic theories of growth which treated science and technology as self-imposing neutral systems. The importance of cultural and structural factors is now recognized. However, despite this recognition, one basic fallacy still pervades the thinking of development agents. It is common practice or even fashionable to make frequent references to cultural and structural factors, while continuing to treat them as external to the technological process itself. It would seem that the first requirement in dealing with the problem of technological development would be to abandon this orthodox conception of technology in favour of an approach which acknowledges the fact that technology is first and foremost a social and cultural process. This applies irrespective of whether the technology comes from outside or from within.

[1/] Kuhn, T.S., The Structure of Scientific Revolutions. University of Chicago Press, 1962 Chicago and London

THE SOCIAL NATURE OF TECHNOLOGY

To appreciate the significance of the foregoing statements, it will be necessary to reveal the intrinsically social nature of technology by going through its elementary forms. In my studies over a period of ten years I have identified about six of these:

(1) The cognitive perception of what is socially relevant. Man in order to grasp the totality of his existence bestows meaning or symbols upon things. The possible connexion between the things so identified constitutes the field of his investigation or self-creation. This implies not only abstracting but also active interaction with the environment (doing).

(2) The implicit connexion between cause and effect has, historically speaking, led to toolmaking. Because toolmaking is socially and culturally determined, different societies seldom fashion identical tools. Indeed, the different patterns of toolmaking and use is the key to the understanding of the rise of different civilizations over time. The variety need not mean that the technical principles involved are radically different. They might well be the same, but differently understood. This is the Achilles' heel of theories of transfer of technology. In the event, the question might be raised: when are transferred patterns of dealing with nature socially and culturally justified?

(3) Behaviour with things (tools and nature), we have suggested, is not at random but rather in accord with the socio-cultural context within which it occurs. Therefore, when taken out of context, technology or behaviour with things is necessarily incoherent and at random. But, historically, there was a time when selective borrowing guaranteed the necessary integration. This was possible because the initiative lay with the borrowers and not with the donors. In modern times the reverse is true. The power of the technologically advanced countries is overwhelming and the imperatives of their economic system have universal consequences. Foreign aid is given, probably with good intentions, but in the process development options are taken away from the local population. Nor is that entirely avoidable, as the developed countries are, historically and objectively speaking, the leaders. The only contradiction is that their constituency is elsewhere and are not open to local challenges. Lack of local capacity gives them descretionary power, which might take long to produce its own negation. The problem is, therefore, how to devise development strategies which would accelerate the development of countervailing forces.

(4) It is apparent that technology is not an individual, but a collective process within a society and between societies. For its success, therefore, coordination or organization is essential. But the criteria for selection and direction do not refer only to the efficient application of technical principles, but also to the whys and wherefores of all production. Inevitably, this involves questions of political power and determination of terms of participation. Governments and bureaucracies in developing countries tend to be unrepresentative of the popular masses. Therefore, when choices are made and agreements reached with foreign agencies, it might be at the expense of the local population. In its quintessential form this might amount to both technological and economic expropriation of the vast majority of the population and, therefore, a negation of development (properly understood).

(5) Basically understood, technology is a reduction of abstract principles to a level which allows mass participation. This is impossible unless there are established ways of monitoring information to actual or potential subjects of the development process. Recurrent arguments about growth from above or from below are reflective of this problem. Unhappily, once again, flow of information is a function of power. Consequently, we can barely talk of technology outside determinate power-relations. This is true of both the relationship between developed and developing countries and among the different social classes in developing countries. Technology, in other words, is not a free-floating commodity, but a differentiated social property which might aid some and be disadvantageous to others.

(6) The implicit clash over access to existing technologies between different contenders spells either confrontation or accommodation. The resolution of the problem depends ultimately on the anthropology of man each society upholds. For the time being, advanced societies have conflicting images of 'developed' and 'underdeveloped' man. This affects their policies toward transfer of technology to the rest of humanity. Likewise, rules in developing countries are imbued with elitist notions of development and are, therefore, prone to regard technology as the monopoly of the privileged.

THE APPLICATION OF TECHNOLOGY

The exposition above is meant to show the complexity of phenomena which are often taken for granted. As such, it is not prescriptive, but could infuse the necessary sensitivity into development planners. In planning certain practical distinctions are useful. Whereas the anthropology of technology might be the same, all technologies do not lend themselves to the same treatment. For instance, aviation, remote sensing, oceanography, fish resources evaluation, etc., are not amenable to stratified programming, i.e., programming that is adjustable to varying levels of technical competence. The same might be true of deep water fishing, but it is certainly not true of all fishing. Apart from industrialized fishing, there is a wide range of fishing techniques which have guaranteed subsistence to millions of people in different parts of the world. (The Chinese have probably done most in reviving and upgrading these techniques and have started exporting them to such countries as Mexico.) It would seem, therefore, that before we can raise questions about technology and expansion of production, the social purpose of production should be clearly identified and integrated in an overall strategy for development. For example, a plan could be devised whereby specialized fishing for international markets is tailored to local fishing and consumption needs. This need not involve knocked-down technologies, but rather a functional articulation between advanced and indigenous technologies. In this way we could dispense with the usual polarized thinking of advanced technologies, on the one hand, and intermediate technologies on the other. In other words, the fashionable term 'appropriate' technology should be purified of its condescending connotations and be given an instrumental value. Technologies are not functional because they are advanced or because they are backward or 'intermediate'. Rather, they are functional because socially and historically they are relevant, i.e., they are scientifically warranted.

SCIENCE AND TECHNOLOGY

One of the implications of the above statement is that technology does not produce itself and therefore, logically, it cannot evaluate itself. Science fulfils both functions. The best illustration of our proposition here is the problem of pollution. While modern technology blindly spews out all sorts of pollution, science is painstakingly searching for the causes and consciously contemplating their implications. Herein comes one of the problems of transfer of technology. Whereas foreign experts are happy to bring advanced technology to developing countries, they are either not willing to accede to the developing countries the equivalent scientific capacity. The reason is simple. While technology is capable of producing value for their sponsors, scientific establishments detract from immediate value and progressively undermine control over the techno-scientific process. This compounds the problem of technological development in backward countries. Our earlier presupposition that advanced technology could be integrated with existing local technologies implied the existence of the requisite scientific capacity. Integration of borrowed technologies has not occurred in developing countries precisely because there are no appropriate agents for it. Scientists in the developed countries are busy responding to the demands of their societies and scientists in the developing countries, and they are busy copying in a parrot-like fashion what the scientists in the first world are doing. Internationally sponsored programmes reinforce this tendency. Thus, education for self-reliance becomes an intractable political and economic problem. This need not be the case. Most of the developing world in absolute terms, excluding Africa, possesses the necessary capacity to generate locally relevant scientific forms. Decolonization of the educational system is realizable because, by and large, it is understood but, politically, it might be impossible because of internal as well as of external vested interests. In the event committed genuine scientists become willy-nilly agitators and, of necessity, their work becomes subversive. If so, what are the prospects for scientifically warranted research and the application of the arts for socially relevant development?

ANNEX 10

Report on the United Nations Conference on Science and Technology for Development (Vienna, 20-31 August, 1979)

by

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For scientists and researchers it is important to note that the UN general conferences are more ideological and diplomatic than scientific or technical. The Conference on Science and Technology for Development held in Vienna in August 1979 is no exception to this general rule. Far from minimizing the importance of the Conference, one is underlining the significance of ideological and social factors in what seems to be neutral and technical forums. While the Conference failed or did not even attempt to define what is meant by "science", "technology" and "development", it succeeded eminently in defining the relative ideological and socio-economic standpoints of the main world blocs, the developed Western countries, the intermediate Eastern countries and the Third World countries.

The Third World countries' basic position at the Conference was to urge parity since they have been victims of colonial exploitation. They maintained this position, without saying what they have done so far with the available resources in their countries. The Eastern bloc supported them, without saying anything about the exploitative role of the elites in developing countries or the nature of the exchange between the socialist countries and the developing countries. In the meantime, the Western countries, while regretting colonial excesses, were unwilling to be party to resolutions which would erode their present economic advantages, e.g.,the unpackaging of foreign technologies. For this reason while pressed to give more financial concessions by both Third World and Eastern European countries, they would not provoke a real debate by calling to book their antagonists.

In the circumstances platitudinous consensus is all that the world representatives and international intellectuals were more or less condemned to. Having acknowledged:

(a) The primary responsibility for the development of developing countries as devolving upon these countries themselves;

(b) The full recognition of the necessity for all countries to rely on their own endogenous scientific and technological capacities;

(c) The recognition of the need by those countries which have suffered from colonialism and foreign domination to strengthen their capacity for creation and innovation, and to avoid the use of scarce human and material resources in creating new needs rather than satisfying existing ones so as enable them to grow and trascend dependency;

(d) The full recognition of the need to adopt measures to create, stimulate and promote the demand for endogenous scientific and technological activities, and for goods and services containing national and regional technology;

(e) The full recognition of the scarcity of financial resources in developing countries which often results in a resource allocation for science and technology far below the critical level required to achieve the desired effect, and therefore the need to establish mechanisms to augment the quantum and improve conditions for the transfer of financial resources for science and technology to developing countries, and

(f) The full recognition of the need for developing countries to attempt, as an alternative, to generate all the scientific and technological knowledge required for their development by taking full advantage of the already available knowledge, they made 47 recommendations. These were divided into three levels of operation: the national, the regional and the international.

A. National Level:

At the national level it was recommended that Governments of developing countries should formulate a national policy for science and technology, which involves carrying out certain essential responsibilities such as planning, budgeting, management, co-ordination, stimulation, promotion and execution of scientific and technological activities relevant to defined development objectives.

Second, it was recommended that technological policies for developing countries should provide for a technological spectrum ranging from the simplest to the most advanced technologies, and that the objective should be to arrive at an optimum combination of capital and non-capital intensive technologies in a country-specific, resource-specific and product-spectific pattern. Third, it was recommended that the use of science and technology for development should include appropriate measures to ensure that it would lead to a constant increase in the wellbeing of the entire population on the basis of its full participation in the process of development.

Nobody in his proper sense would quarrel with these recommendations on technical grounds. However, sociologically and politically, they are fraudulent. First of all, the financial resources they imply are unattainable under the present patterns of surplus appropriation at the national as well as the international level. Politically, those countries which took at face-value recommendations for self-reliance would be the first losers, as has happened in the recent past.

Second of all, participation on a mass-scale in a developing country cannot be achieved short of a full-scale social revolution, as it would doubtless affect radically the existing patterns of resource allocation. We know who fights against revolutions in developing countries. Therefore, there is a dilemma here and, probably, scientists cannot do much more than identify its exact nature and its constraining effects. There cannot be any successful science which is socially uninformed. European hystory is full of examples, if only not fully recognized except by a few.

Under institutional arrangements the Conference recommended that developing countries should, at the national level, ensure compatibility and coordination of the activities of the different components of the science and technology system, especially enterprises and research and development institutions, in a long-term perspective. Furthermore, it was recommended that the bodies responsible for science and technology policy should have close working relationships with the authorities managing and planning social and economic development, particularly to ensure the integration of science and technology in development programmes and to prevent science and technology efforts from being isolated from, or out of step with, other national development objectives.

This is a significant point, not dissimilar from one of our points of discussion in the last workshop. As in our last meeting, it is subject to tension between a sector-analysis approach and a holistic approach to development problems. While it glibbly talks about social and economic development, as in all positivist theory, it presupposes that the only form of rational knowledge is science in the narrow sense. It has no social criteria for evaluating science. It has only technocratic criteria which are limited to only the practitioners, who in developing countries constitute not even 1 percent of the population. Any suggestions about popular participation under these conditions become an unrealisable pipe-dream or sheer international and national propaganda.

real world self-interest governs the behaviour of nations, the basis for sharing among nations would have emerged as one of the fundamental problems in the present international economic order. For the realization of even a minimum programme for action among nations, something has to give, i.e., the beginnings of a New International Economic Order - the exact opposite of charity - has to be implemented.

In this regard the Conference recognized the importance of international organizations, especially those within the UN system. It pinned its hopes for immediate action on a better coordinated United Nations effort. Departing more or less from what it called the usual UN "institutional approaches", it recommended inter alia that:

(a) Development cooperation activites should not be conceived in sectoral terms but should take fully into account the main interactions that a well-conceived development process triggers among the various sectors comprising national, subregional, regional and interregional circumstances and realities;

(b) In view of the need to reduce autonomous and isolated actions by the numerous component parts of the UN system, there is need to ensure coordination between them in the light of the integrated nature of the development process itself and the fact that considerations of a technical nature should be viewed in their economic, social and cultural context in the carrying out of these activities;

(c) Modification and, if necessary, redefinition of objectives, policies and criteria, in response to the general commitment by all member states to treat science and technology as an integral part of the New International Economic Order - (unspecified, as in all UN declarations since 1975).

It was further recommended that, for purposes of channelling additional resources to the building of endogenous capabilities of developing countries, special arrangements be made to increase the flow of financial resources, on a predictable, continuous and united basis, for science and technology for development in the developing countries.

In support of its proposed Programme of Action, the Conference recommended that the General Assembly of the UN should establish a high-level intergovernmental committee, to be known as the "Intergovernmental Committee on Science and Technology for Development". This is intended to replace the old Committee on Science and Technology for Development of the UN Economic and Social Council. The basic function of the Committee will be to formulate policy guidelines for the harmonization of policies of the organs, organizations and bodies within the UN system in regard to scientific and technological activities, on the basis of the proposed Programme of Action and with a view to contributing to the establishment of the New International Economic Order.

The Conference emphasized that, in effecting structural transformations, UN programmes should pay special attention to the results of the negotiations on:

(a) The international code of conduct on the transfer of technology;

(b) The international code of conduct relating to transnational corporations;

(c) The revision of the Paris Convention for the Protection of Industrial Property.

Ideologically and politically, these are to be regarded as important steps in the right direction within the international forum.

Finally, while upholding the principle of bilateral arrangements, the Conference recommended that the General Assembly establish a financing system for science and technology for development. Among possible supplementary sources of finance for the UN Committee, it enumerated international and regional financial institutions, public and private banks,

B. Regional Level:

Collective self-reliance at the regional level, with the view to strengthen the internal capacity of individual developing countries and to improve their bargaining position was one of the recommendations of the Conference. Presumably, this was made in the spirit of the TCDC programmes adopted by the UN a few years ago. Owing to the fact that this was treated purely at the technical level, the implications of "self-reliance" or building up of cartels among developing countries were not analysed. This is despite the impact of OPEC on the international economic, monetary and political system, which has given rise to extremely defensive behaviour by the developed countries as is shown by the deadlocked South-North dialogue. In the event, were the developed countries making the recommendation, provided it did not go against their interests? It might well be, for the developed countries refused to commit themselves to an automatic transfer of financial resources to developing countries for purposes of augmenting the latter's development capability.

Whether in fisheries research or any other field of economic production, increased regional capacities may imply loss of markets or competition for limited resources for the advanced countries. In an international system which emphasizes more competition than sharing, this is a problem which should be faced honestly by the international community, instead of pretending that technology is a free commodity available to all comers. The USA was unwilling to endorse any resolution or practical strategy for monitoring the research activities and package deals of the multi-nationals. Under bilateral agreements it saw no reason why multi-nationals should not enjoy the same privileges as other enterprises or agents.

Yet, it is known that it is through such bilateral arrangements that unity is undermined. Individual gain is a strong incentive for developing countries to make deals behind the back of their partners. The developing countries were never challenged to account for themselves in this regard. Under the present conditions any regional team of dedicated scientists is liable to frustration and demoralization.

It must therefore be recognized that building of appropriate regional scientific and technological institutions goes far beyond any technical considerations that might confront scientists. It involves intricate socio-economic processes which scientists in developing countries must reckon with and press for appropriate solutions, instead of abdicating from responsibility in the name of positivist science.

C. International Level:

The Conference acknowledged that there is a need for action on the part of the developed countries to support and facilitate the internal efforts of developing countries to achieve development through the establishment of endogenous scientific and technological capacities. Such action should be geared toward sharing of knowledge and experience and the enhancement of the range of options available to developing countries in the process of achieving their nationally defined development goals.

In the light of this acknowledgement the Conference urged developed countries to support scientific and technological research aimed at solving the problems of developing countries. The Conference must have been advocating some form of charity, as it failed to say what would be the advantage of such aid to the developed countries. In fact, most of the recommendations in this section contradicted the suppositions about self-reliance at the national and regional levels. Their conception of the role and the responsibility of the developed countries amounted to nothing less than advocating a "dependency relation" between the developed and the developing countries.

This was bound to be the case because the discussion was largely taken out of the context of the present international economic system. Certain unjustified moral suppositions were made about the developed countries. If it had been acknowledged that in the public and private corporations. The role of the UN as a broker between rich and poor countries is worth studying as an alternative to bilateral aid which always has strings attached and is liable to abuse by local elites. Of immediate relevance to the UN Advisory Council for Fisheries Research Development in developing countries is the final recommendation of the Conference that:

The General Assembly should create an intergovernmental group of experts, appointed on the basis of equitable geographical distribution, to undertake with the support of the Director-General for Development and International Economic Cooperation a prompt and thorough study of all relevant arrangements for the operation of a financing system for science and technology for development. Included in the terms of reference is that:

(i) The study should make an assessment of the requirements for additional funding for science and technology activities in developing countries and of potential sources of funding;

(ii) The study should include an inventory of existing multilateral and bilateral programmes for providing financial support for such activities;

(iii) The study should review alternative proposals, including all the proposals put to the Conference by the Group of 77 for generating requisite additional funds for science and technology development activities on a long-term basis.

It would seem that some of the recommendations made in our last meeting have a direct bearing on the above. It is conceivable that our input on fisheries research development globally would be indispensable: so would be our representation in the so-called intergovernmental group of experts. Such participation would guarantee a share in the interim allocations for which a target figure of no less than US$ 250 million has been announced. Up-to-date information on the follow-up work by the UN Development Programme Administrator is needed.

ANNEX 11

Evaluación de los programas multilaterales en el campo de la investigación de recursos pesqueros en Cuba

por

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El presente trabajo se ha preparado con el objetivo de presentar al Grupo de Trabajo para la Promoción de la Investigación sobre Recursos Pesqueros en los Países en Desarrollo, establecido por el Consejo Asesor de FAO sobre Investigaciones de Recursos Marinos (CAIRM), las experiencias de los proyectos de ayuda del PNUD/FAO a la República de Cuba en materia de investigaciones sobre recursos pesqueros. Para su confección se utilizaron los informes finales de los expertos de diferentes proyectos; así como otras informaciones y experiencias de los autores, quienes participaron activamente en la ejecución de una parte considerable de estos programas.

Son muchos los aspectos que pudieran considerarse para evaluar el efecto de los proyectos de ayuda multilaterales a los países en desarrollo. Sin embargo, en este trabajo se seleccionan para el análisis la contribución que hizo este tipo de colaboración a la adquisición de conocimientos sobre los recursos pesqueros del país receptor, la creación de facilidades para realizar investigaciones; así como la contribución al fortalecimiento de la experiencia científica nacional. Además, se hace notar que la obtención de resultados positivos en la ejecución de un programa no depende solamente del personal internacional o de la agencia ejecutora, sino también del interés y del apoyo que brinde el Gobierno del país receptor a la actividad objeto del proyecto.

ANTECEDENTES DE LA PESCA EN CUBA

Hasta 1959 la pesca cubana tenía un carácter de subsistencia y se llevaba a cabo en la zona costera y alrededor de los cayos que componen el archipiélago cubano. Cerca de 10 000 pescadores con algo más de 5 000 embarcaciones capturaban anualmente alrededor de 28 000 t de peces y mariscos costeros.

Las únicas pesquerías con algún grado de tecnificación eran: la de cherna americana, llevada a cabo por 57 goletas en la sonda de Campeche, la de túnidos pequeños realizada por 45 barcos de vara y carnada viva en la zona occidental de la isla y la de camarón, con 40 barcos en la parte sudoriental. El resto de la flota estaba formada por embarcaciones pequeñas de remo, vela y algunas de motor.

La industria procesadora contaba con 9 plantas pequeñas dedicadas a la elaboración de productos de langosta, camarón y atún para la exportación. El consumo de pescado era del orden de 4,0 kg anuales por habitantes.

No existía infraestructura para realizar investigaciones pesqueras ni se había formado personal científico nacional en esta rama.

Sin embargo, la revolución de 1959 trajo, como consecuencia, un cambio en la estructura económica del país y en la actitud oficial en cuanto a la pesca, llevándose a cabo de inmediato un programa de desarrollo pesquero que incluia, entre otros objetivos principales, la creación de cooperativas pesqueras y de empresas estatales de producción, la construcción de embarcaciones pesqueras modernas, la capacitación de pescadores, la modernización de la industria y la participación activa del estado en el sector pesquero para planificar e impulsar su desarrollo.

Debido a la importancia que concedió el Gobierno a la pesca y gracias al esfuerzo económico realizado, la producción pesquera cubana, que como se ha dicho había sido en 1959 de unas 28 000 t, sobrepasó en 1970 las 100 000, en 1975 las 140 000 y alcanzó en 1978 las 213 300 t.

En estos mismos años se creó y desarrolló el Centro de Investigaciones Pesqueras, el cual tenía en 1960 solamente ocho trabajadores y ya en 1979 contaba con 330 integrantes, entre ellos 93 con grado universitario.

La colaboración y la ayuda exterior contribuyeron notablemente al desarrollo pesquero cubano, pues sólo en los programas de investigación han colaborado junto al personal científico nacional, expertos de la República Democrática Alemana, Polonia, URSS, República Popular de China y República Democrática Popular de Corea en proyectos bilaterales y de FAO en diversos proyectos auspiciados por el PNUD. A través de proyectos multilaterales Cuba recibió entre 1961 y 1979 la visita de 28 expertos de diversas especialidades, los cuales permanecieron en el país entre 3 meses y 7 años, con una presencia física de seis expertos a la vez.

Los proyectos del PNUD se orientaron a complementar las necesidades de ayuda, en los campos que el país tenía menos asistencia bilateral.

Esto era, inicialmente, en la evaluación de recursos pesqueros costeros, tecnología de pesca artesanal, acuicultura y contaminación. Posteriormente los proyectos especiales del PNUD, además de los objetivos enumerados, incluyeron temas de investigación sobre recursos pesqueros y técnicas de localización y captura de especies de altura.

El entrenamiento de personal cubano fue un componente incluido invariablemente en todos los proyectos multilaterales de ayuda que recibió el país. En la modalidad de becas alrededor de 30 cubanos fueron capacitados en el exterior y en cursos ad hoc, conferencias y entrenamiento en el trabajo; prácticamente todo el personal que se estaba formando en los centros de investigaciones y otros de la industria y de otros sectores económicos, relacionados parcialmente con la pesca, recibieron entrenamiento por parte de los diferentes expertos de los proyectos de ayuda multilateral.

Por último, estos proyectos aportaron equipos en instrumentos de laboratorios, para barcos de investigaciones, para talleres experimentales, de transporte terrestre y para bibliotecas y oficinas.

CONTRIBUCION DE LOS PROYECTOS DE AYUDA AL CONOCIMIENTO DE LOS RECURSOS PESQUEROS CUBANOS

No es posible establecer cuantitativamente la contribución de los proyectos de ayuda multilaterales al conocimiento de los recursos pesqueros cubanos, porque, por un lado el desarrollo pesquero de este país se ha enmarcado en un programa nacional complejo que ha contado con un apoyo decidido por parte del Gobierno y de las organizaciones sociales influyentes en el país, y las investigaciones sobre recursos pesqueros, como parte del programa de desarrollo de la industria pesquera, se han beneficiado de dicho apoyo de manera multifacética. En este contexto, los programas multilaterales han constituido una parte de las fuentes de recursos materiales y de fuerza de trabajo calificada, pero no han sido la única. Además entre los programas de ayuda, el Gobierno ha contado con la colaboración bilateral en el desarrollo pesquero y sus resultados frecuentemente se han unido a los obtenidos por los proyectos multilaterales, sin que resulte posible separar la porción que corresponde a una u otra parte.

Por otro lado, la cuestión de determinar el aporte de cada parte al conocimiento alcanzado no es tan importante, siempre que se pueda apreciar en términos cualitativos que ha habido progreso en la adquisición de conocimientos y que se puedan identificar las áreas donde los programas multilaterales han resultado efectivos.

En sentido general, los proyectos del PNUD/FAO han ayudado al Gobierno cubano a incrementar los conocimientos sobre los recursos pesqueros de la zona costera, el mejoramiento de las técnicas de captura, la acuicultura, la contaminación marina y cierto avance en la comprensión de la biología pesquera de varias especies de importancia comercial.

De una manera específica se pueden enumerar los éxitos de estos proyectos, pero en aras de no llenar este análisis de datos innecesarios, baste decir que en el transcurso de 18 años, con ayuda de los proyectos multilaterales, se exploraron las posibilidades de pesca del atún y especies afines alrededor Cuba, se exploraron y evaluaron recursos como el camarón, la cherna americana y otras especies en la plataforma cubana y en zonas adyacentes y se estudió el estado de los recursos pesqueros en diversas zonas del Atlántico.

Además, se llevaron a cabo experimentos múltiples para introducir nuevas técnicas en las pesquerías cubanas.

Los resultados en cuanto a evaluaciones de pesquerías fueron altamente satisfactorios, no así en lo concerniente a las técnicas de pesca, ya que los proyectos confrontaron muchas dificultades para echar a andar los barcos y para conseguir ciertos materiales y piezas de repuesto que escaseaban en el país y aunque hubo avances en el trabajo, no se lograron todos los objetivos que se proponían los proyectos.

La acuicultura, que fue incluida en la mayor parte de los proyectos de desarrollo pesquero, alcanzó buenos resultados, particularmente en el cultivo del ostión de mangle, donde se diseñó y desarrolló un método original que tuvo gran repercusión para el desarrollo ulterior de la producción ostrícola.

La contaminación marina fue estudiada por algunos expertos de los proyectos multilaterales y sus contrapartes nacionales, con resultados positivos, aunque no siempre se logró comprensión entre lo que deseaba la parte nacional y el trabajo que querían emprender los expertos, pero en el balance resultante el país obtuvo beneficios.

Además de las contribuciones enumeradas, los expertos de los proyectos de ayuda participaron en el análisis de muchos otros problemas relacionados con la evaluación y el aprovechamiento de los recursos pesqueros del país, que no aparecen reflejados en los informes finales, pero que ayudaron a las autoridades nacionales a tomar decisiones sobre el manejo de sus recursos pesqueros y contribuyeron a incrementar la capacidad de los científicos nacionales.

También merece ser destacado que una parte considerable de los logros alcanzados por los proyectos de ayuda llevados a cabo en Cuba, han tenido repercusión regional, ya que especialistas de países vecinos viajan frecuentemente a Cuba a familiarizarse con los avances científicos y técnicos alcanzados por el país en el manejo de los recursos pesqueros y algunos han recibido beneficios directos de los estudios realizados por Cuba sobre recursos pesqueros compartidos con ellos. Otros han solicitado asistencia técnica cubana para introducir resultados sobre acuicultura y otras materias, obtenidas por los científicos nacionales y sus colegas de los proyectos multilaterales de ayuda.

En los informes finales de los diferentes proyectos que han sido consultados para la confección de este trabajo no aparecen reflejadas plenamente las dificultades y las fallas de los programas, pues además de las acciones positivas, existieron dificultades que disminuyeron el éxito de los proyectos y se cometieron errores y fallas que de haberse superado, los logros hubieran sido mayores.

Entre las dificultades encontradas en la ejecución de los proyectos, fueron significativas las de índole material. En el caso de Cuba, país que se encontraba en pleno proceso revolucionario y que estaba sometido a un bloqueo comercial impuesto por el Gobierno de los Estados Unidos de Norteamérica y por otros estados vecinos, no era posible obtener equipos, piezas de repuesto o servicios técnicos en toda la región.

Cualquier facilidad de este tipo había que resolverla en Europa o Asia, lo que hacía retardar mucho los suministros que requerían los proyectos.

Otra dificultad encontrada fue la poca eficiencia del sistema de FAO para reclutar expertos. Por este concepto dejaron de cumplirse objetivos importantes de los proyectos, ya que en algunos casos no aparecían candidatos para cubrir determinadas plazas o FAO proponía al Gobierno especialistas que resultaban rechazados por carecer de la calificación o la especialidad y la experiencia necesarias.

También hubo incompresiones ocasionales entre el personal internacional y los contrapartes, que de no existir, los resultados de algunos proyectos hubiesen sido mejores, pero este tipo de dificultades se presentó raramente y siempre fue resuelto por ambas partes de manera satisfactoria.

Por último, la contribución de un proyecto al conocimiento de un objeto como los recursos pesqueros se debe medir también por el uso que se haya hecho de esos conocimientos, porque si no se utilizan en función del desarrollo del país receptor pueden convertirse en un simple aporte al enriquecimiento de los Curricula Vitae de los científicos o para aumentar la cantidad de información que poseen las agencias internacionales y otras entidades ajenas al país en cuestión.

Los resultados de las investigaciones llevadas a cabo por los proyectos de ayuda, así como las de otros proyectos bilaterales y de marco nacional sobre los recursos pesqueros cubanos, fueron utilizados por el Gobierno y la industria pesquera de este país para estructurar y fundamentar científicamente los planes nacionales de desarrollo pesquero. Prueba de su utilidad lo constituye el hecho de que en 1978, Cuba había duplicado las capturas de su zona costera en comparación con las que obtenía en 1959, estaba explotando racionalmente las especies más valiosas de su fauna marina (langosta, camarón, etc.) y se preparaba para aumentar la producción de ostión de mangle a través del cultivo artificial de este molusco.

Estos resultados en la producción eran posibles en parte gracias a los conocimientos que se habían alcanzado sobre el comportamiento de los recursos pesqueros.

Estos hechos, además, evidencian que los proyectos de ayuda para el estudio de los recursos pesqueros resultan efectivos, solamente cuando el país receptor ha definido una política nacional de desarrollo pesquero y se encuentra dispuesto a enfrentar el desarrollo con sus propios medios, de manera que los aportes de los programas de colaboración exterior sirvan de catalizadores que potencialicen las posibilidades propias del país.

Esta es, por otro lado, la única forma de asegurar que los resultados de un proyecto de ayuda sean bien utilizados, que haya estabilidad en el trabajo científico y que quede garantizada la continuidad del desarrollo después de finalizado un proyecto.

CONTRIBUCION DE LOS PROYECTOS DE AYUDA A CREAR FACILIDADES PARA INVESTIGACIONES EN EL PAIS

Los proyectos del PNUD/FAO, llevados a cabo en Cuba para el estudio de los recursos pesqueros incluían como norma un componente importante en equipos. En las condiciones específicas de Cuba esto resultaba muy significativo, ya que como se ha dicho anteriormente, el país sufría un bloqueo comercial en la región y la adquisición a tiempo de ciertos equipos e instrumentos necesarios para la investigación podía decidir el éxito del trabajo científico.

No obstante, y a pesar de cierta lentitud observada en la compra y envío de dichos equipos por parte de la Sede Central de FAO, a través de los proyectos multilaterales se equiparon barcos de investigaciones, diversos laboratorios, talleres experimentales, bibliotecas y oficinas.

Los proyectos ayudaron también a diseñar y poner en funcionamiento un sistema de recolección de información estadística, que llegó a constituir una base de datos imprescindibles para la investigación de los recursos pesqueros.

Estas facilidades, junto a otras que fueron creadas en el país a través de proyectos bilaterales y por la gestión directa del Gobierno, permitió al Centro de Investigaciones Pesqueras mantener un trabajo científico estable y continuar funcionando con un nivel de eficiencia aceptable, aún después de finalizado cada proyecto de ayuda multilateral. Además, con la infraestructura creada y el personal científico que se había formado en los últimos 20 años, el país estaba en capacidad de colaborar y brindar un apoyo modesto, pero efectivo, al desarrollo de las investigaciones y al entrenamiento de personal científico y técnico de otros países en desarrollo y de participar activamente en las comisiones y conferencias pesqueras internacionales.

CONTRIBUCION DE LOS PROYECTOS DE AYUDA AL FORTALECIMIENTO DE LA EXPERIENCIA CIENTIFICA NACIONAL

Los proyectos de ayuda sobre investigaciones de recursos pesqueros en Cuba se llevaron a cabo en el Centro de Investigaciones Pesqueras y aunque eventualmente colaboraron con otras instituciones científicas, o con la industria u otras esferas de la administración pesquera, su sede permanente fue el CIP. Este Centro ya existía cuando el país comenzó a obtener los proyectos de asistencia técnica, por lo cual, en Cuba, no se dió el caso de establecimiento de centros para la investigación de recursos pesqueros con ayuda internacional.

Sin embargo, este Centro creció y se convirtió en una institución científica importante del país recibiendo la influencia de los proyectos de ayuda bilaterales y multilaterales.

Como ya se ha dicho, prácticamente todo el personal científico nacional dedicado al estudio de los recursos pesqueros recibió entrenamiento a través de becas en el exterior, cursos *ad hoc* o conferencias y entrenamiento en el trabajo, organizados por las autoridades nacionales, con la participación de los proyectos de colaboración bilaterales y multilaterales.

En 1979 había en el CIP más de 90 especialistas nacionales con grado universitario y la mayor parte de ellos había recibido entrenamiento especializado y estaban capacitados para ejecutar tareas de investigación por si mismos. Además, los líderes científicos y muchos funcionarios de la administración pesquera poseían experiencia de trabajo científico adquirida en las diferentes modalidades del entrenamiento especializado que proporcionaron los proyectos de colaboración externa.

La preparación científica y técnica de personal nacional es, probablemente, la contribución más valiosa que han hecho los proyectos de ayuda al desarrollo de la capacidad de Cuba para realizar investigaciones sobre recursos pesqueros. Por eso consideramos necesario hacer algunos comentarios de la experiencia cubana sobre las diferentes modalidades del entrenamiento.

Las becas de los proyectos internacionales duraban entre 3 y 6 meses, lo cual era considerado un plazo razonable para becarios con grado universitario y 2-3 años de experiencia como mínimo.

Los candidatos a becarios eran seleccionados por las autoridades nacionales entre el personal científico joven, atendiendo a sus cualidades personales, interés por el trabajo científico y seguridad de que al regreso de la beca continuarían trabajando en la institución.

Este método de selección y, por supuesto, una política de empleo estable, que garantiza a los científicos un puesto de trabajo asegurado y una renumeración comparable a la que pueden obtener en otras instituciones nacionales, le dan una gran estabilidad al personal en los centros de investigaciones.

Tomemos como ejemplo los resultados del Proyecto PNUD/FAO que se ejecutó en Cuba entre 1972 y 1974. A través de este proyecto, 9 científicos jóvenes recibieron becas en el exterior y transcurridos 5 años despúés de finalizado el proyecto, 6 de los 9 becarios continuaban trabajando en el mismo centro, uno pasó a ocupar otra responsabilidad en el Ministerio de la Industria Pesquera, pero de acuerdo con su especialidad, otro pasó a trabajar a la Academia de Ciencias, también de acuerdo con su especialidad y sólo uno de los 9 dejó su especialidad y se fue a trabajar a otra organización.

Los seminarios y las conferencias resultaron muy útiles tanto para el personal de la institución donde se llevaban a cabo los proyectos, como para participantes de la industria pesquera y de otras instituciones científicas afines y, por último, el entrenamiento en el trabajo que representa la forma más directa de transmisión de conocimientos y habilidades fue ampliamente utilizada en los proyectos en Cuba. Al mejor aprovechamiento de estas formas de entrenamiento contribuía, un procidimiento instituido oficialmente por el Gobierno, que obligaba a las autoridades nacionales y a los expertos a evaluar los progresos de las contrapartes e informar de los resultados periódicamente.

Además, los expertos y los contrapartes debían trabajar en los mismos locales y participar conjuntamente en los trabajos de campo y en los de laboratorio, lo cual creaba un ambiente de confianza mutua que propiciaba muy bien la transmisión permanente de conocimientos y experiencias.

CONCLUSIONES

De lo antes expuesto se pueden hacer las conclusiones siguientes:

1. La industria pesquera cubana experimentó un desarrollo significativo en los últimos 20 años y los proyectos de colaboración bilaterales y multilaterales desempeñaron un papel importante en ese desarrollo.

2. Los proyectos de ayuda multilaterales para el estudio de los recursos pesqueros se integraron al programa nacional de desarrollo del sector pesquero y aunque no se puede evaluar cuantitativamente la participación que tuvieron en los éxitos alcanzados por el país, se reconocen como una de las fuentes importantes de apoyo.

3. Estos proyectos, junto con otros de ayuda externa, contribuyeron efectivamente a incrementar los conocimientos sobre los recursos pesqueros, crearon facilidades para realizar investigaciones y en general hicieron aportes al fortalecimiento de la experiencia científica nacional.

4. En la ejecución de los programas multilaterales hubo dificultades de tipo material que impidieron el logro de algunos objetivos parciales. Particularmente resultó difícil la adquisición de equipos e instrumentos de investigaciones y se cometieron fallas como la contratación de expertos internacionales, debido a cierta lentitud de FAO para reclutar personal de campo.

5. Los resultados de los programas multilaterales fueron ampliamente utilizados por el Gobierno y la industria en la planificación del desarrollo pesquero y se considera que uno de los factores más importantes en la utilización efectiva de la colaboración externa, lo constituyó la existencia de una política nacional definida de desarrollo pesquero y el respaldo oficial a este sector de la economía.

ANNEX 12

Technical Assistance Rendered by the Federal Republic of Germany to Thailand (1961-1975) in Marine Fisheries Research and Development

by

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1. INTRODUCTION

Up to the present, fisheries have played a vital role in the economy of Thailand. Fish provides highly nutritious and relatively cheap animal protein for most of the Thais, the so-called "poor majority". The farmers of the country are often part-time fishermen, catching fish in fresh water impoundments, canals and ditches for their own consumption. The surplus is sold fresh in local markets or processed in a traditional way.

Owing to limited technology, the marine fisheries of the country up to the 1950s consisted of inshore and coastal fisheries, employing traditional types of fishing gear such as bamboo stake traps, set-bag nets, Chinese purse seines made of cotton twine introduced to Thailand during the 1930s, and gill nets made of synthetic fibre which were introduced after the Second World War.

Pre-1950 production from fisheries remained stagnant at about 200 000 t annually (approximately 50 000 t being the inland and aquacultural production), even though there had been a steadily mounting demand for fish owing to the rapid population increase after the Second World War.

The importance of fisheries in the economy of Thailand was not officially recognized until the Government formulated the First National Economic and Social Development Plan, which was implemented during 1962-1966. Since 1962, fisheries development has been considered an integral part of this plan.

With the Government's support in terms of budgetary allocation and facilities and the dynamic leadership of the Department of Fisheries during the 1950s and 1960s, together with the return of government and private students who had received long-term training abroad in fishery research and management, it was an opportune time for an assistance project. The German project, conceived in 1958, was initiated in 1961 with the support of both the Government and private sectors.

This paper is prepared with the objective of presenting a descriptive review of the technical assistance project in the field of marine fisheries research and development under the bilateral arrangement between the Governments of the Federal Republic of Germany and Thailand. The paper also presents an assessment of the achievements and limitations of the aforementioned project, particularly:

(1) The impact of the project in terms of knowledge about the fishery resources and information utilized in the development and management of local resources;

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(2) The impact of the project on the development of facilities and skilled manpower to carry out resources research in the future, and

(3) Shortcomings of the project, such as unchecked development which has led to biological overfishing of the demersal fisheries resources in the Gulf of Thailand.

2. DESCRIPTIVE REVIEW OF THE AID PROJECT OF THE FEDERAL REPUBLIC OF GERMANY RENDERED TO THAILAND (PROJECT FORMULATION AND IMPLEMENTATION)

In 1958 while serving as FAO lecturer in the Training Course for Mackerel Research organized by FAO in Bangkok, Dr. K. Tiews of the Federal Research Board for Fisheries in Hamburg (FRG), discussed his experience in the Philippines and the fisheries situation in Thailand with Dr B. Indrambarya, then Director-General of the Department of Fisheries of Thailand. Dr Tiews was of the opinion that since the utilization of pelagic resources (mainly mackerel) in Thailand was well advanced, the utilization of other resources should be considered in the development of marine fisheries of the country. In this connexion, it was suggested that the marine fisheries in Thailand could be expanded by introducing trawl net fishing (Tiews, 1973). In planning for marine fisheries development under the First National Economic and Social Development Plan which was to commence in 1962, the Government of Thailand was receptive to the proposed idea and consequently requested the Federal Republic of Germany (FRG) to render assistance to Thailand in its marine fisheries development under the bilateral agreement of 9 October 1956 between FRG and the Kingdom of Thailand regarding economic and technical cooperation. The request approved by FRG was implemented from 23 May 1961 and was the beginning of a series of successive phases in which FRG assisted Thailand in her marine fisheries research and development.

Subsequently, the German bilateral aid project was divided into four phases, as follows:

Phase I (23 May to 11 September 1961)

This phase covered experimental fishing in the Gulf of Thailand employing various types of trawl nets, the development of a suitable trawl net for use in Thai waters and the exploratory survey of demersal fishery resources in the Gulf of Thailand (Tiews, 1962, 1966).

Phase II (27 July 1962-9 October 1964)

The second phase of the project entailed a continuation of the demersal resources survey and the training of some fishermen, Department of Fisheries biologists and research vessel crew in the use of otter-board trawl net fishing methods. Many demonstrations of this type of fishing gear were made for fishermen in several fishing villages along the coast (Ruamraksa and Isarankura, 1965; and Tiews, 1965, 1965a, 1966).

Phase III (25 August 1965-12 February 1972)

The third phase of the project saw the successful establishment of the Marine Fisheries Laboratory in Bangkok; the strengthening of research capability of scientific personnel at the laboratory; the continuation of the resources survey; the initiation of the biological-bionomic study of commercially important species of fish (Tiews, 1966); and Thailand extended its technical cooperation to Malaysia in the survey of its demersal fishery resources off the east coast of the Malay Peninsula, 1 March-11 April 1967 (Marine Fisheries Laboratory, Bangkok, 1967; Wongratana, 1968).

Phase IV (13 February 1972-12 February 1975)

Phase IV consisted of the establishment of a sister laboratory arrangement between the FRG Fisheries Research Institute in Hamburg and the Marine Fisheries Laboratory of the Department of Fisheries in Thailand (Huschenbath and Harms, 1976; Steinberg, 1976).

Each of these phases will be considered in more detail.

2.1 Phase I

Phase I of the project can be considered as the cornerstone of the series of German aid to Thailand in the field of marine fisheries research and development. In order to investigate the possibilities of operating trawl fisheries in the Gulf of Thailand, the first phase was carefully planned by the German Mission. Tactics involved in its implementation included the following:

(1) Experimenting with different types of trawl nets to develop a trawl net suitable for use in the Gulf of Thailand;

(2) Introducing this ideal trawl net into the fishery by training local fishermen in its use, maintenance and manufacture;

(3) Training local fishermen in the use of fish detecting (echo-sounders and fish finders) and radio-telephone equipments;

(4) Conducting initial investigations on the composition, distribution and size of bottom fish resources in the Gulf of Thailand, and

(5) Advising the Thai Department of Fisheries on the biological production basis of a trawl net fishery in the Gulf of Thailand with regard to the development of a trawl fishery and steps which should be undertaken with respect to the scientific investigations of the available fish stocks.

In implementing this project, the FRG Government supplied, at its own expense, 16 trawl nets of various types; four fish detection gear of various types; two fish net winches; three sets of radio-telephone equipment; and a team of four experts, consisting of a fishery biologist, a masterfisherman, a gear technologist (net-maker), and an engineer. The Thai contribution consisted of three counterpart staff members who served during the entire expedition. Furthermore, the Government of Thailand had arranged for the participation of a private fishing company in the project. The firm, Harinsutra Company, built, at its own expense, two stern trawlers, 22.7 m long and equipped with 225 hp engines. The same company paid the expenses of two groups of fishing crews of eight men each. The active participation of the private sector, at the beginning of the project, was vital to the rapid development of Thai trawl fishery in subsequent years (Tiews, 1962).

The work programme: In the experimental fishing programme, six experimental and demonstration fishing trips of some seven-days duration were carried out in the waters off Prachuabkirikhan Province, Gulf of Thailand. One hundred and thirty-three hauls with a total towing period of 230 h were made during these experimental fishing cruises. On the basis of these expeditions, the German Mission drew up a construction plan for an ideal otter-board trawl net to be used in the Gulf of Thailand to assess the abundance of the demersal resources. The results obtained served to advise the Thai Department of Fisheries on the state of the stock of those resources and the probable trend of development of trawl fisheries in Thailand.

Regarding the size of the resources, Tiews (Ibid.) made the initial estimate of the demersal fish biomass to be at a minimum from 250 000 to 375 000 t, of which 60 percent are within fishing grounds close to Thailand. The results of this initial calculation demonstrated that the demersal resource stock size was limited. He, therefore, recommended that the trawl fisheries in the Gulf of Thailand should gradually develop and the change of the stock size should be monitored on a regular basis in order to manage the fisheries resources in the future. Another outcome of his assessment concerned the design of a suitable otter-board trawl net to be used in the Gulf of Thailand for various sizes of fishing boats. In summary, he concluded that the trawl fishing in the Gulf of Thailand could be carried out with excellent economic success.

2.2 Phase II

With the promising outlook of Phase I, the Government of Thailand submitted another request for technical assistance to the Government of the Federal Republic of Germany, and the request was approved and subsequently implemented from July 1962 to October 1964. During Phase II, two German experts, a masterfisherman and a gear technologist, were assigned for a period of two years to the Thai Department of Fisheries. The FRG Government also provided the following set of equipment to Thailand to be used on the research vessels of the Department of Fisheries and for demonstration purposes in the training courses of this project: 35 sets of trawl nets with repair materials; 2 fish net winches; and 3 echo-sounders. The Government of Thailand provided four research vessels and operating funds, plus counterpart staff. These vessels were substituted for the two commercial vessels utilized in Phase I.

During Phase II, the experts were instructed to undertake the following activities:

- to supervise the construction of three research vessels for the Department of Fisheries;
- to train the crew members of these research vessels in trawl net fishing methods;
- to organize and implement training programmes in the construction and maintenance of trawl nets, and
- to assist the Department of Fisheries in improvements of trawl fishing gear.

In addition to the duties and responsibilities assigned to the two experts, a detailed plan for research to be carried out by the Department of Fisheries scientists, with particular reference to the monitoring survey of the trawl fishery resources, was outlined.

The results of this project phase were gratifying. With the close supervision of the experts, improved research vessels were built which had particular features which enhanced their stability and sea worthiness; they had enlarged fish holds. Concerning crew training, 64 training days at sea were given to the crew members of the four research vessels. Another 10 days at the sea were spent to train the crew of two shrimp trawlers of the Department, and further, another 98 days were spent by the experts aboard RV PRAMONG NO. 2 in the monitoring survey of the trawl fisheries resources. As regard the week-long training courses for fishermen, a total of 260 fishermen from various fishing villages, most of whom skippers, received training in the construction and maintenance of fishing gear. A one-week training course was also organized for a group of fishermen from Malaysia.

Further improvements of the German trawl net were made during Phase II by using stronger net materials for the lower part of the net and attaching 24 iron rings of 1 kg each, instead of the usual chain, below the ground rope when fishing on a muddy bottom. This feature was useful for conducting trawl net fishing in the Gulf of Thailand, the bottom of which mostly consists of soft mud ooze.

Phase II analysis of the catch and effort data of the research vessels operations indicated that further expansion of the trawl fisheries in Thailand during the mid-1960s was possible, but the Mission warned that some species might not withstand the increased fishing pressure. Hence, the Mission recommended that the development of the trawl fishing fleet should be carefully controlled (Tiews, 1965a; Tiews *et al.*, 1967).

2.3 Phase III

Under the bilateral arrangement concluded on 25 August 1965, the two Governments agreed to jointly establish a Marine Fisheries Laboratory in Bangkok. The objective of this Laboratory was to ascertain the basic biological conditions for fish production as required for the development of Thai fisheries. The research carried out involved studies on the taxonomy, biology and bionomics of commercially important species including the distribution and abundance of these species in relation to hydrographic factors. The goal of this research was to obtain a clear picture on the state of the stocks and the fluctuations thereof induced by both fishing and natural causes. The study also served as a basis for the expansion of the Thai trawling fleet in international waters.

In implementing this project phase, the FRG Government provided the following:

- a marine fishery biologist as Co-director of the laboratory for a period of two years;
- a fishing gear expert for a period of two years who assisted the marine fishery expert in the training of Thai experts and fishermen on the basis of the results of research work carried out by the laboratory, and
- a set of equipment and instruments for the Marine Fishery Laboratory.

Furthermore, the FRG Government arranged for the training of Thai biologists in Germany for a period of 6-9 months.

The Thai Government provided a counterpart Director, land and buildings, technical and clerical staff, as well as additional equipment and instruments, including a number of research vessels.

During Phase III which lasted six years, the Marine Fishery Laboratory was constructed in the compound of the Fish Marketing Organization of Thailand in Bangkok. The laboratory was a concrete structure with a working space of approximately 1 200 m^2 in the initial stage, subsequently enlarged to 1 500 m^2.

The laboratory was equipped with a wet laboratory for processing fresh fish, a taxonomic laboratory, a plankton analytical area, a chemistry laboratory and a dry laboratory for data processing. The cost of construction was approximately Baht 1.8 million (US$ 90 000). It was opened for operation on 24 June 1965.

Since its inauguration, the Marine Fishery Laboratory has been utilized for various research projects, including pelagic, demersal and invertebrate investigations as well as the service unit called the Marine Laboratory Unit. The organization chart of the Marine Fishery Laboratory is shown in Table 1.

Since the establishment of the Marine Fisheries Laboratory with the support of the Thai Government, the number of scientific personnel has increased substantially, thus enabling the various units to undertake research on the life histories of certain commercially important species with particular attention paid to demersal species. Furthermore, monitoring surveys of the demersal fishery resources in the Gulf of Thailand have been carried out on a regular basis. Oceanographic studies conducted in the inner Gulf of Thailand and off the west coast of the Gulf have shed light on the productivity of these waters in relation to the abundance of commercially important resources, such as the Indo-Pacific mackerel (Marine Fisheries Division, 1979).

During this period, a number of research biologists were sent abroad for further training, either through national scholarships or other aid programmes. The FRG Government also provided fellowships for eight Thai biologists to further their training in Germany.

The Marine Fishery Laboratory likewise collaborated closely with institutions in and outside the region in fishery research endeavours. For example, in 1967 a cooperative trawling survey off the east coast of the Malay Peninsula, in which German, Malaysian and Thai researchers took part, resulted in increased knowledge about the demersal resources, in particular their density distribution in those waters. In addition seminars pertaining to research results were organized by the Marine Fishery Laboratory. More than 60 contributions were presented at the symposia organized by the laboratory during 1970-72. Since then, seminars have been organized periodically; the last one was held in 1979 (Marine Fisheries Division, 1979).

2.4 Phase IV

Under the bilateral arrangement between the FRG and Thai Governments dated 5 November 1971, the Federal Research Board for Fisheries in Hamburg, provided its services under a partnership with the Marine Fisheries Laboratory from February 1972 to February 1975. Under this partnership arrangement, a few German experts were sent to Thailand for a period from three to four weeks each. Selected Thai fishery experts had the opportunity to further their training or to conduct study tours at fishery research institutions in Germany. The expenses incurred were paid by the Federal Republic of Germany. During Phase IV, four German senior scientists were sent to Thailand to conduct experiments and to assist Thai counterparts in their research studies.

A baseline study on the accumulation of DDT, TDE, DDE, dieldrin, lindane and PCB in marine and fresh-water aquatic organisms in Thailand was carried out by Dr E. Huschenbath from 21 August to 18 September 1972. In this connexion, samples of aquatic organisms were sent to FRG for analysis. The report of this study was presented at the International Seminar organized by the German Foundation for International Development in Berlin, 19 November to 6 December 1974 (Huschenbath and Harms, 1976). The report indicated that the accumulation of these pollutants was still below the threshold level in general, although there was a trend toward increasing accumulation.

Dr R. Steinberg conducted a series of experiments in February-March 1973 on the high opening trawl net and pelagic paired trawls in the Gulf of Thailand and deep-sea trawling for prawns in the Andaman Sea. His studies revealed that the high-opening trawl net was very efficient in comparison with the standard trawl net. The experiment on pelagic pair trawl did not reveal any positive results, possibly due to the limited period of experimentation (Steinberg, 1976).

From 5 March to 5 May 1973, Dr H. Rosenthal assisted Thai biologists in experimental hatching of Indo-Pacific mackerel and white sea bass (*Lates calcarifer*). This assistance has played a vital role in the success for the first time in the hatching of Indo-Pacific mackerel under controlled conditions (Dhebtaranon and Chotiyaputta, 1974).

Dr Klauswitz of the Senckenberg Museum in Frankfurt assisted the Thai taxonomist at the Marine Fisheries Laboratory in the identification of several groups of fish in Thailand. His assistance led to the discovery of several new species of fish in Thai waters (Wongratana, 1976, 1976a, 1977).

During this project phase, nine Thai biologists were sent to FRC for training and/or study tours, for a period of 3-3^1/2 months. Several of these biologists are still working with the Department of Fisheries.

3. PROJECT EVALUATION

The German bilateral assistance project had a very great impact upon the development of Thai fisheries. This section will consider both its positive contributions and limitations.

3.1 Positive Contributions

3.1.1 Development of the Marine Fishing Industry in Thailand

Prior to 1960, the fisheries of Thailand were confined to utilization of fresh-water aquatic organisms in inland waters and to marine fish and invertebrates in the inshore waters along the coast (Tiews, 1962). Fishing boats employed in inshore fisheries prior to the Second World War were mainly non-powered sail boats. During the 1930s, purse seines made of cotton twine were introduced from China and are still known as "Chinese purse seine". They have been employed to catch pelagic fish such as Indo-Pacific mackerel in coastal waters. Increased numbers of motorized boats using monofilament nylon gill nets of various sizes were introduced in Thailand after the Second World War and gained popularity among Thai fishermen. Most of the marine fisheries of the country during 1945-60 may be considered as subsistence fisheries employing about 1 400 motorized vessels and about 1 440 non-motorized vessels of less than 40 m length (Tiews, 1962). The number of active fishermen during the said period was estimated by the Department of Fisheries at approximately 32 000. However, including small-scale fishermen, the number is probably much higher since there had been no fishery census prior to this period.

During 1945-60, besides traditional fishing gear used in subsistence fisheries, such as hand and troll lines, lift nets, cast nets, set bag and bamboo stake traps, new types of fishing gear were introduced. These included nylon gill nets which contributed to an annual landing of approximately 150 000 t of marine catch. Likewise, after the Second World War there were some improvements in the efficiency of purse seines. The size of the net was smaller and the gear was operated by a fishing boat instead of two row boats to set the net, as in the case of the "Chinese purse seine".

Trawl net fishing had been experimented with in Thailand by private companies in 1952 and 1953, but the results were unsatisfactory owing to the lack of experience in the use of the trawl gear and to the limited knowledge about the sea environment (Ruamraksa and Isarankura, 1965). However, as a result of these trawling experiments, the fishermen of Samutprakarn Province accepted the concept of trawl net fishing and started to design and use small-scale shrimp trawlers or beam trawlers, not exceeding 20 gross tons. Fishing was usually conducted in shallow waters and the result was so satisfactory that the majority of inshore fishermen of the country switched from the use of traditional gear to this type of trawl. Since the introduction of otter-board trawl net fisheries to Thailand in 1962 under German bilateral aid project, the past two decades have seen a remarkable change in the structure of the marine fisheries sector of Thailand.

From 1947 to about 1960, the total fish landing was approximately 200 000 t, of which some 50 000 t were from inland fishery production. Since the introduction of the otter-board trawl net fishing in Thailand during the early 1960s, the total landing increased manifold, reaching the peak of 2.189 million t in 1977, of which 2.1 million t or about 94 percent were marine fish (Figure 1). The spectacular increase of marine fisheries production is correlated to the rapid development of the trawl net fishing in and outside the Thai territorial waters. Three types of trawling, viz., the otter-board trawl net, pair trawl and beam trawl , contributed approximately 58 percent of the total marine landing, valued at Baht 3 151 million (US$ 157.6 million).

The rapid expansion of the trawl fisheries can be seen from the increased number of registered trawlers which rose from 99 boats in 1960 to 5 204 in 1976. Since 1966, owing to the rapid development of trawl fisheries in Thailand and increased fishing pressure, there has been a steady decline in the abundance of demersal resources in Thai territorial waters. The Thai trawling fleet has been forced to extend its operations further out into the high seas, in the waters of various neighbouring countries. It has been estimated that more than 600 000 t were caught annually by the Thai trawling fleet outside the Thai waters, particularly after 1969 (SCSP, 1976 and 1976a).

The vessels have become larger, and are equipped with refrigeration units, modern navigation and fishing aids. From 1974 until the present, the large trawlers have operated in the waters of Bangladesh and India. This development has placed Thailand among the "distant-water fishing nations" of the world (SCSP, Ibid.).

The rapid development of Thai marine fisheries had great impact upon the economic and social development of the country. In 1977 the marine fishery production of Thailand had the total value of more than US$ 415 million (SEAFDEC, 1979). Thailand also received increased income from the export of marine products in the same year valued at US$ 175 million. Hence, marine fishery has been of significant benefit to the economy of the country and is a major element in the gross national product. Income from fisheries increased steadily from Baht 1.2 billion in 1963 to Baht 12.7 billion in 1978, a tenfold increase during this 15-year period.

3.1.2 Change in the structure of Thai fishing populations

In considering the structure of the Thai fishing populations prior to 1960, the fishing industry of Thailand then consisted of small-scale fishing households. Since 1962, when otter-board trawling methods were introduced, the marine fishery experienced rapid growth with a considerable change in the structure of the fishing population. This fact was brought out in the Report of the FAO/UNDP South China Sea Fisheries Development and Coordinating Programme Mission to Thailand (Marr et al., 1976) which stated:

> "The marine fishery of Thailand is (now) basically commercial rather than small-scale or artisanal-oriented. Prior to the advent of otter-board trawling in the mid and late 1960s, the main catch was composed of small pelagic species caught inshore by fixed types of gear and several types of simple purse seines, as sell as artisanally caught invertebrates and the collection of several kinds of molluscs. Artisanal fishing methods still prevail in some coastal areas, most notably among the Muslim population in provinces close to the Malaysia border, but documentation of this sector of fishery is almost non-existent. With a tenfold increase in the marine catch from less than 150 000 t in 1960 to over 1 500 000 t in 1972, such an increase is only possible with a change from labour to capital intensive investment, employing modern technology and equipment."

The changes mentioned above have more or less affected the marine fishing industry employment structure. The total number of fisheries households decreased from 50 968 in 1967 to 40 198 in 1976. During this period enterprise fisheries increased significantly from 2 752 in 1967 to 6 311 in 1976, while the number of subsistence households decreased from 35 940 in 1967 to 25 558 in 1976. The change is also reflected in the reduced number of non-motorized vessels from 14 710 in 1967 to only 5 367 in 1976, as compared with the increase in the number of motorized vessels from 18 871 in 1967 to 20 768 in 1976.

Comparable to the 1960 figure for the number of fishermen said to be approximately 70 000, this may be underestimated and the true amount, including small-scale fishermen, may actually be substantially higher than the figure given by the Department of Fisheries (SCSP, Ibid.).

Finally, the rise in the number of high-cost gear, such as trawl nets, and the decline in the number of traditionally non-mobile gear, for instance, traps and set-bag nets, are clear indicators that during the past 20 years the pattern of fisheries has shifted from primarily subsistence to enterprise or commercial fisheries.

The Mission of the South China Sea Programme (SCSP, Ibid.) observed that the fisheries enterprises could be considered as the backbone of the marine fishing industry of Thailand. It further concluded that the development of the marine fishing industry of Thailand had reached its peak in terms of employment, boat building and production. Hence, at present this industry must expand its activity in the high seas in order to obtain investment returns as soon as possible.

3.1.3 Development of fishery-related industries

The development of trawl fisheries has also played an important role in stimulating the development of other economic sectors. For example, in the early years most Thai boat yards specialized in the construction of small wooden vessels, but at present several boat yards can build steel boats. According to a 1978 survey carried out by the Fishing Boat Development Unit, Marine Fisheries Division, Department of Fisheries, there was a total of 170 shipyards, 33 of which had repair facilities, capable of building 800 vessels annually. In 1978, 406 fishing vessels were under construction (Marine Fisheries Division, 1979). Likewise, various accruments necessary for the fishing vessels such as ropes, nets, winches, etc., were necessary. Hence, this need stimulated various factories to either diversify their products or else start anew.

Since 1965, the number of fishing ports has increased in order to accommodate the greater catch. However, the port facilities are at present inadequate. Hence the Government has a plan to expand the port facilities to absorb the increased landings. Since 1973, nine port facilities planned or under construction have been budgeted (Marr et. al., 1976). Roads have been or will be constructed to improve transportation communications, thereby generating further employment opportunities.

Although fishery products for the domestic market did not alter appreciably during the trawl fishery development, improvements in handling techniques, transportation and marketing have permitted a wider distribution of fresh fish. There has been a noticeable increase in frozen pelagic species, the Indo-Pacific and Indian mackerels and round scads, a practice which has helped to even out supply and spread distribution. The Cold Storage Organization increased the volume in frozen species from 1 655 t in 1972 to 3 087 t in 1974. Ice factories were likewise involved and increased production, thereby employing more people. Plants for processing traditional products have grown in order to meet the needs of increased landings: 108 fish plants in 1969 compared with 121 in 1974 (Marr *et al.*, 1976).

Owing to the high percentage of so-called "trash fish" not used for human consumption, fish meal plants increased in number. In 1973 there was a total of 56 fish meal plants with an annual capacity of 155 900 t. The manufacture of fish meal grew in direct proportion to the trawl industry. The fish meal, and fresh trash fish are used in catfish culture, in duck and poultry farming as well as swine rearing. A steady development in these industries was a by-product of the advancement in trawl fisheries.

3.1.4 Increased capability of marine resources research

The German aid project which contained a series of recommendations for marine fishery resources research has been an impetus to the development of the research capability of the scientific staff of the Thai Department of Fisheries. It has also influenced the decision of the Thai Government to give increased financial support, particularly under the First and Second National Economic and Social Development Plans, 1962-66 and 1967-72. This increase in the standard of research has placed Thailand among the well-advanced fishery research countries in the Southeast Asian region.

Since the initiation of the German aid programme in 1961, there has been remarkable progress in the acquisition of research facilities and research staff, particularly in the Division of Marine Fisheries. Prior to 1961, the Department of Fisheries had only one active research vessel, MV ASA, a 60 gross ton Gulf of Mexico shrimp trawler donated by the United States Government to the Department of Fisheries. Thus, marine research at that time was conducted on a very limited scale.

In 1966, when Dr Tiews submitted his Third Report on Marine Fishery Research Programming to the Department of Fisheries, there were eight research vessels built during the period 1962-66. These consisted of two steel stern trawlers built in Japan during 1963-64 and six wooden stern trawlers built in Thailand during 1963-66. Because of the accelerated marine fisheries development programme, the vessel facilities expanded considerably and 12 research vessels were in the possession of the Marine Fishery Division in 1979.

Regarding scientific personnel, in 1966, 57 research workers/biologists were attached to the Division of Research and Investigation of the Department of Fisheries (Tiews, 1966a). In 1980 the number of research staff rose to 96. Several of these researchers have had additional training either through short-term courses or academic programmes abroad during 1965-1979.

3.1.5 Increased knowledge about the fishery resources

The establishment of the Marine Fisheries Laboratory in 1965 under the Division of Research and Investigation (which in 1973 became the Division of Marine Fisheries) of the Department of Fisheries contributed significantly toward understanding the resources and environment in the Gulf of Thailand. With the continued interest and support of the Thai Government, especially during the 1960s, and with the increasing number of trained scientific personnel, the Marine Fisheries Laboratory was able to undertake research and study on pelagic, demersal and invertebrate resources. Moreover, the laboratory carried out studies on oceanography and the taxonomy of marine aquatic organisms in the Gulf of Thailand. In subsequent years, the Marine Fisheries Laboratory extended its cooperation to research laboratories in the region; for example, by training in trawl data processing and through the cooperative German-Malaysian-Thai survey of demersal resources in the waters off the east coast of the Malay Peninsula.

The Marine Fisheries Laboratory is, consequently, a central research institute for marine resources research of Thailand, rendering advice as to the research directions of the marine fisheries stations of the Division of Marine Fisheries.

The Marine Fisheries Laboratory propagates its research results through a serial publication called "Contribution of the Marine Fisheries Laboratory". More than 20 publications have been issued under this series. Research results have also been published separately in the annual reports of various research units of the laboratory, viz., Pelagic Fisheries Investigation Unit, Demersal Fisheries Investigation Unit, Invertebrate Fisheries Investigation Unit and Marine Fisheries Investigation Unit (Table 1). Unfortunately, these publications have been mostly written in Thai and are, therefore, not widespread among the international scientific community.

(a) Taxonomy and Reference Collection

Since its inception, the Marine Fisheries Laboratory has undertaken the identification of fish found in Thai and adjacent waters. Banasopit and Wongratana (1967) reported that in the reference collection maintained at the laboratory there were 124 families, 289 genera and 574 species. Subsequent studies by taxonomists at the laboratory (Wongratana, 1968; and Wongratana and Sukhavisidh, 1979) have added more than 280 species to the list, thus making a total of 850 species known to occur in Thai waters.

Taxonomic studies on molluscs and crustaceans have also been carried out. More than 300 species of molluscs and over 100 species of crustaceans have been identified, and specimens are maintained in the reference collection of the laboratory (Chaithiemwongse, 1975, 1979).

A total of 238 species of plankton, collected mainly in the Gulf of Thailand, 91 being phytoplankton and 147 zooplankton have been identified, and specimens kept at the reference collection. Zooplankton samples comprise mainly copepods, Chaetognatha, Noctiluca and Ctenophora (Subapepan, 1978).

(b) Studies on the Marine Environment

This project undertaken by the Marine Fisheries Laboratory has added substantial knowledge about the oceanography of the Inner Gulf of Thailand (Bight of Bangkok). This area was not extensively covered by the Naga Expedition, a cooperative survey between Thailand, Viet Nam and the USA during 1959-1961 (Robinson, 1974). Furthermore, the laboratory has extended its cooperation to the National Research Council of Thailand in carrying out a baseline study on marine pollutants in the Inner Gulf of Thailand. During the past five years, the area under study has been extended further to the west coast of the Gulf of Thailand. In this project the primary productivity of the waters was assessed. The results of these studies are summarized in the Report on the Seminar on Marine Fishery Development organized by the Marine Fisheries Division in Bangkok, 9-12 January 1979 (Marine Fisheries Division, 1979). One of the significant results of this study was that the Inner Gulf of Thailand was found to be very rich, comparable to several productive areas in the world. The average primary production rate of sampled waters in the Inner Gulf was 3.51 gc/m^2/day in 1978.

(c) Life History and Bionomics of Commercially Important Species

The Pelagic Fisheries Investigation Unit of the Marine Fisheries Laboratory has, since 1965, carried out a systematic survey on pelagic eggs and larvae, mainly on mackerels, scads and anchovies. Together with regular biological samplings, the spawning seasons and spawning grounds of these species have been ascertained (Boonprakorb, 1962, 1966; Sidtichokpan, 1976; Marine Fisheries Division, 1979).

As a result of research conducted at the Marine Fisheries Laboratory, the biology of the Indo-Pacific mackerel is well understood at present (Dhebtaranon and Chotiyaputta, 1974). During the past ten years, life history studies on other commercially important pelagic species have been carried out. The early life history and the biology of certain species of demersal fish have also been studied by the Demersal Fishery Investigation Unit of the Laboratory.

(d) Catch and Fishing Effort Statistics

In implementing the recommendation of the German experts, the Marine Fishery Laboratory has paid particular attention to the improvement in the compilation of catch and fishing effort statistics. In close collaboration with the Statistical Section of the Department of Fisheries, fishing effort statistics have been compiled from log books, as in the case of mackerel fishery, and through sampling surveys in the case of demersal fisheries and some other species of pelagic fish. These statistics have been utilized in the evaluation of the states of the stocks and the level of fishing in subsequent years.

(e) Stock Evaluation

With detailed knowledge of the biology and life history of the Indo-Pacific mackerel and with the availability of catch and fishing effort statistics, assessment of the stocks of the Indo-Pacific mackerel was made in early 1970 (Menasveta *et al.*, 1973; Hongskul, 1974) and a reassessment was conducted again in 1978 by the South China Sea Programme (SCSP, 1978a). The knowledge gained from this evaluation indicated that the stock of mackerel on the west coast of the Gulf has been fully exploited. However, on the east coast of the Gulf, there is a possibility of further development of the fisheries. In the Malacca Straits, the exploitation level has almost reached the maximum potential yield, and increased fishing effort would significantly increase the total catch of these species. As for the demersal resources, attempts have been made to assess the biomass and the maximum potential yields thereof (Tiews, 1962; Isarankura, 1969; Gulland, 1972; Shindo, 1973;SCSP, 1976 and 1976a, 1978 and 1978a). The seminar organized by the Marine Fisheries Division in Bangkok in January 1979, revealed that the annual maximum potential yield was 686 640 t at a water depth of less than 50 m, which is equivalent to the effort of approximately 7.5 million h. However, the level of exploitation in 1976 was as high as 750 000 t (Marine Fisheries Division, 1979).

The Marine Fishery Division during the past five years has also attempted to make preliminary estimations of the potential yield of some other species, including anchovies, scads, sardines, Spanish mackerel, bonitos and sea prawns. The results of this estimation are contained in the report of the seminar mentioned under 3.1.5 (b) above (Marine Fisheries Division, *Ibid.*).

3.1.6 Fishery management regulation

Greater information about the state of the stocks of the Indo-Pacific mackerel has played a significant role in the formulation of the regulations of that fisheries, including the adoption of a closed season and the prohibition of certain types of fishing gear during the mackerel's spawning and nursery seasons (Boonprakorb, 1976). Unfortunately, there have been no studies on the effect of these regulations on the mackerel stocks, particularly those along the west coast of the Gulf. Furthermore, enforcement of the regulations is not yet effective owing to the lack of manpower, sea facilities and supporting funds on the part of the enforcement agencies and the lack of cooperation of certain groups of fishermen.

As regard the trawl fishery management, the Ministry of Agriculture and Cooperatives has issued various ministerial notifications under the Fisheries Act, B.E. 2490, attempting to regulate these fisheries. These regulations were partly based on scientific evidence supplied by the Marine Fishery Laboratory. However, the enforcement of these regulations has not been effective and this will be discussed further under "Limitations".

3.2 Limitations

3.2.1 Depletion of demersal resources

As indicated above, the introduction of trawl net fishing under the German aid project resulted in the spectacular increase of marine landings in Thailand, contributing substantially to the country's economy. Notwithstanding the recommendations of the German Mission in early 1962 that the trawl fishery development in Thailand should be carefully planned because of the limitations of the resources and the later recommendation made by the trawl committee, the development of Thai trawl fisheries was left unchecked and as a result, it has been difficult to exert efficient control on these fisheries. The rapid increase in the fishing intensity has adversely affected the demersal fishery resources, in both the Gulf of Thailand and in the Andaman Sea. In the Gulf of Thailand the catch rate decreased from 297 kg/h trawling in 1961 to approximately 66 kg/h trawling in 1977 (Sakurai, 1979). This means that the fishable stocks greatly decreased by more than 70 percent. The decline in the abundance of the demersal fishery resources has forced the trawl fishing fleet to operate further from Thai shores, resulting in a significant increase in the investment of the trawl fishing industry. Subsequently, the general market price of fish has risen substantially and this has adversely affected the consumer who has often a low income. This is contrary to the objective of the development plan that Thailand should increase its food supply, particularly the cheap demersal fish for her rapidly expanding population.

3.2.2 Wastage of resources

Even though the standard German trawl net (so called "Engel net") has a cod-end mesh size of 4 cm, various types of trawl nets used by the Thai trawler fleet have mesh sizes ranging from 1.7 to 2.3 cm. Thai trawl catches are composed mainly of small-sized fish. In 1962 when the German project undertook a feasibility study on the introduction of trawl net fishing in Thailand, the catches from the experimental trawl fishing consisted on the average of 60 percent of good fish and 40 percent of so-called "trash fish". However, in 1976, the catch composition (percentage by weight) of Thai trawlers consisted of 69 percent trash fish and only 31 percent good fish in case of otter trawl. Sixty-four percent of trawh fish and 50 percent of good fish and shrimps were caught with beam trawl. A preliminary study carried out by the Demersal Fisheries Investigation Unit of the Marine Fisheries Division indicated that more than 30 percent of the so-called "trash fish" consisted of juveniles and fry of several commercially important species (Vadhanakul et al., 1975).

During the fishing trips while the trawlers are in the fishing grounds, most of the trawl catch are sorted out and the boat will retail only good fish and the immature fish and "trash fish" are thrown overboard. Only when the boat is ready to return to the home port will trash fish be kept for sale on the deck. The amount of trash fish discarded is estimated to be approximately 50 percent of the total catch during each fishing trip.

This wastage is evident when the marine landings and the corresponding values of ASEAN countries are examined. Even though the annual landings of Thailand from 1973 to 1977 were very high in comparison to those of the other ASEAN countries, the value of the landings was low in comparison to that of respective ASEAN countries. This was due mainly to the substantial amount of low valued fish in the trawl catches.

3.2.3 The small-scale fisheries

According to the statistics, the number of Thai subsistence fishing households was 35 940 in 1967. Since then, the number has gradually decreased until 1976 when the number was 25 558. This figure is according to a fishery census made by the Department of Fisheries, but the actual number may, of course, be greater than the figures indicated. These subsistence fishermen are at the lowest strata of the economic force with low productivity and income. It can be said that this small-scale fishing community was outside the main stream of the marine fishery development initiated in Thailand during the 1960s. Although the German bilateral aid project contributed significantly toward the development of the Thai marine fishing industry, the benefits from the project mostly went to the corporate sector which had capital to invest rather than to the grass root small-scale fishermen who were by-passed by the aid project.

3.2.4 Institutional aspects

In selecting the site for the Marine Fishery Laboratory in 1965, the location within the compound of the Fish Marketing Organization was recommended as the most suitable and preferable owing to the following advantages:

- convenience in obtaining samples of fish and aquatic organisms because commercial catches were daily landed at the pier of the Fish Marketing Organization;
- samples from all parts of the Gulf of Thailand could easily be obtained;
- close proximity to the Department of Fisheries, and
- suitable pier for mooring research vessels of the Marine Fishery Laboratory.

In subsequent years the location became unsuitable because of the limited space and the fact that the building could not be expanded. Furthermore, there has been a significant increase in the traffic congestion in the area, thus impeding the communication between the laboratory and other institutions in Bangkok. Most of the catch are now transported by truck from various ports throughout Thailand and very few fishing vessels land their catch right at the pier of the Fish Marketing Organization. When catches transported by truck come from various places, the researchers cannot determine exact fishing locations. This hampers the collection of reliable catch and biological statistics which are imperative for stock assessment purposes. Thus, the Marine Fishery Laboratory must send its personnel to collect samples of fish at the major fish landing ports along the coast.

Some of the technical personnel trained in the Federal Republic of Germany did not return to a position commensurate to their training programme. Furthermore, certain equipment sent by the Federal Republic of Germany to the Laboratory has not been utilized to the fullest extent.

Since the 1970s the policy of the Thai Government has changed with increased emphasis on aquaculture. Hence, the financial support for marine fishery research, and for the maintenance of laboratory has not been in proportion to the amount required. This has affected the morale of the marine fishery researchers to a certain extent, even though marine fisheries still comprise more than 90 percent of the total fisheries production.

3.2.5 Fisheries management

As regards the regulation of the trawl fisheries, the Ministry of Agriculture and Cooperatives issued a Ministerial Notification on 20 July 1972 prohibiting the use of trawl nets of various types, such as push nets and shrimp push nets, which are used with motorized fishing boats within 3 km from the shoreline and within the radius of 40 m from stationary gear licensed by the Department of Fisheries. Furthermore, trawl net fishing is not allowed in certain areas of the Gulf.

It is apparent that the present fishery trawl regulations are not effective, as the major cause of the decline in the abundance of demersal resources is due to the high fishing intensity in the Gulf of Thailand. However, the occurrence of overfishing was recognized by research workers of the Marine Fishery Laboratory since 1968. A trawl committee set up by the Department of Fisheries then recommended urgent management measures, including limitation on entry for the trawl fisheries in the Gulf of Thailand. Because of the prevailing political circumstances at that time, the trawl fishing industry was allowed to overexpand. However, the recommendation of the trawl committee was reiterated by the South China Sea Programme Mission in 1975 (SCSP, 1976) and subsequently by Moore (1978).

3.2.6 Others

Although Tiews (1962) initially suggested that the German bilateral aid project would encourage other donor countries to contribute toward the development of Thai fisheries, there was no evidence of this. Quite the contrary, the long-term German aid project seemed to have discouraged inputs from western countries who turned their attention toward other developing countries as priority areas for aid. Since 1975, even the FRG has terminated its donations of funds, expertise and equipment to Thailand.

Table 1

Organization chart of the Marine Fisheries Laboratory,
Department of Fisheries, Bangkok, 1965

- Director
  - Marine Laboratory
    - Administrative work
    - Technical Work
      - Library and Literature Unit
      - Reference Collections
      - Plankton Analysis
      - Water Chemistry
      - Assessment of Primary Productivity
      - Assessment of Benthic Biomass
      - Data Processing Unit
  - Pelagic Fisheries Investigation
    - Stock Assessments
    - Life History and Behaviour Study
    - Distribution of a Species and Identification of Sub-populations
    - Age and Growth Determination
    - Tagging Study
  - Demersal Fisheries Investigation
    - The research units outlined in this project are essentially the same as those of the Pelagic Fisheries Investigation
  - Invertebrate Fisheries Investigation
    - Taxonomy of Important Species
    - Population Distribution and Identification of Sub-populations
    - Coastal Culture and Shrimp Farming
    - Life History and Behaviour Studies
    - Tagging Study
    - Stock Assessments

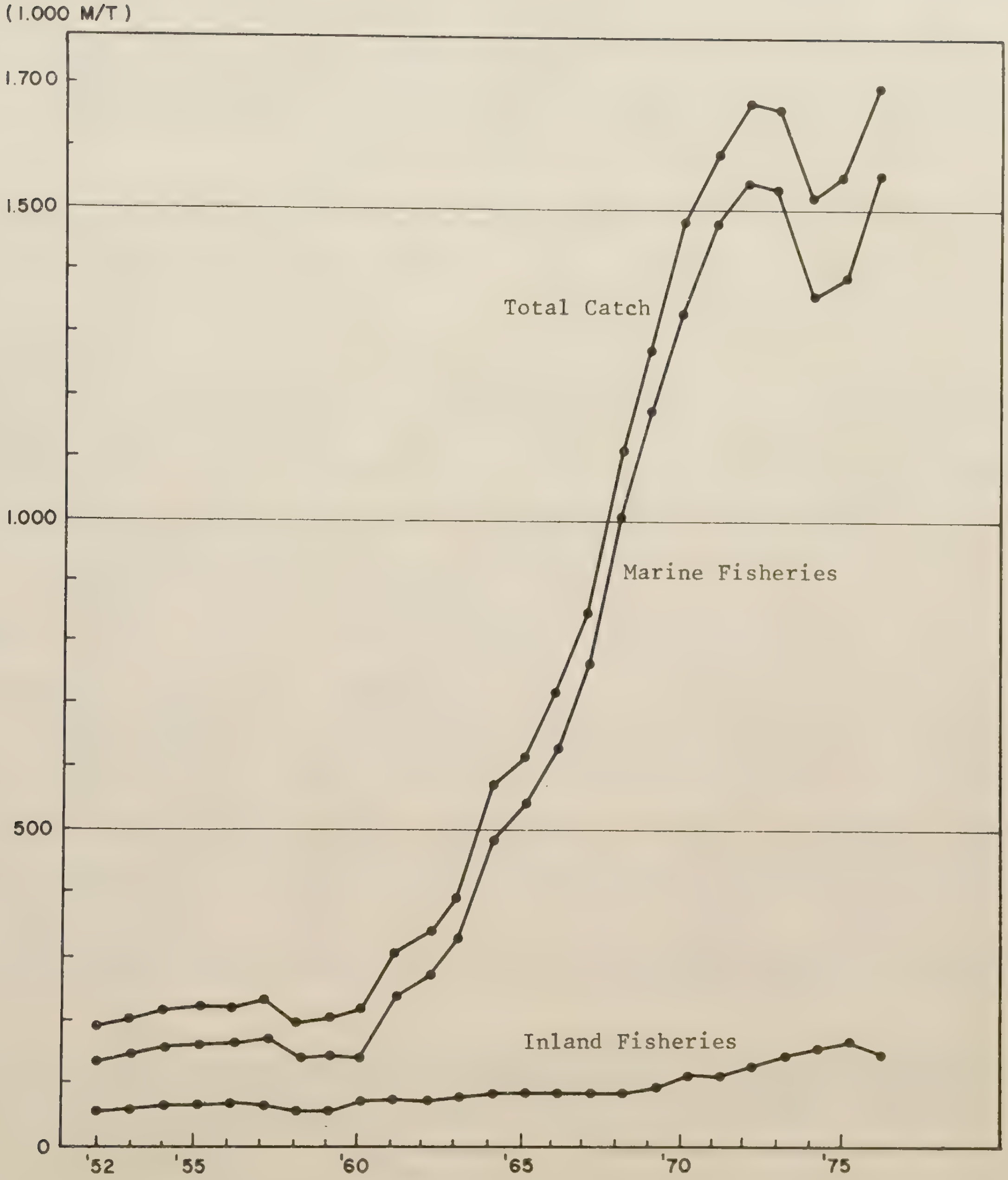

Figure 1 Development of Fisheries Industry Both in Marine and Inland Fisheries

Source: Department of Fisheries, Fisheries Records of Thailand

4. SUMMARY AND CONCLUSION

The German bilateral assistance programme rendered to Thailand in marine fishery research and development was carefully planned and implemented. It was likewise a long-term project covering a period of more than fourteen years of active participation. This assistance has significantly contributed toward the rapid expansion of the Thai marine fishing industry, in particular, trawl fisheries. The development has resulted in the betterment of the economy of the country in terms of greater food supply for the rapidly expanding population, increased employment and foreign exchange reserves. Furthermore, the project was an impetus to enhance the research capability of marine fishery scientists in Thailand, resulting in greater knowledge about the fishery resources and how to conserve them.

However, this assistance project also had some limitations. The unchecked development of trawl fisheries has resulted in a drastic decline in the abundance as well as wastage of demersal fishery resources. Furthermore, the project made little contribution toward the development of small-scale fishing communities.

During the implementation of the German aid project, the success of one phase led to another: the feasibility study undertaken as Phase I was continued and strengthened during Phase II; then the need for a centralized laboratory to continue research was felt and this comprised Phase III; finally, once the laboratory was goind strong, there was the possibility of exchanging Thai and German expertise. All of the phases were given the full support of both Governments involved. This support was not only in terms of funds and equipment, but also in regard to the personnel involved. The Chief of the project was most energetic as were the two Directors-General of the Department of Fisheries. Likewise, the German experts were very capable and they were matched by eager Thai Scientists, newly graduated from the United States, who returned to Thailand with new concepts about fisheries management. In addition, there was enthusiastic participation of the private corporate fishing sector at the outset. All of these factors contributed toward the positive outcome of the project.

As reported by Tiews (1973), the causes of limitations of the project included lack of sufficient catch and effort statistics. In the early 1960s, the taxonomy, life histories, stock characteristics and behaviour of various species were not understood. Owing to these deficiencies, the stock assessments made during the 1960s were inaccurate and this misinformation influenced the Thai Government to develop trawl fisheries too quickly and without adequate checks. Regulations issued were not based on thorough scientific evidence. Because of the special circumstances at that time, the project was allowed to become overblown without due consideration that there might not be a need in future for so many trawlers. The fisheries overexpanded and faced the drastic social and economic difficulties associated to the reduction and control of fishing effort. Then, too, only the corporate interests were served, instead of the entire fisheries of Thailand. This has led to a recession during the 1970s, aggravated by spiraling fuel costs.

Taking into account both the achievements and limitations of the project, however, it may be concluded that the German bilateral assistance programme yielded benefit to Thailand's fisheries, particularly enterprise intensive companies. This project could serve as a model of a successful one, not only in Thailand but in other developing countries. The success of this project has led Indonesia and Malaysia to request bilateral assistance from the FRG to initiate similar types of activities in those countries. This project also clearly demonstrated that a long-term and carefully planned aid programme with modest inputs could have a great impact on fisheries research and development in a developing country.

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ANNEX 13

Review of the Achievements of the Norway/FAO Pelagic Fishery Survey Project on the Southwest Coast of India

by

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1. PROJECT DESCRIPTION

The Pelagic Fishery Project sponsored by UNDP, FAO and the Government of India became operational in February 1971.

The area of operation of the Project was confined to the southwest coast of India from Ratnagiri (17° Lat.N) downward and extended to the southeast coast up to Tuticorin (9° Lat.N), extending offshore to a depth contour of about 200 m.

The Project functioned in two stages - the first phase, 1971-75, was subcontracted to the Norwegian Agency for International Development (NORAD) and the second phase, 1976-79 was directly handled by FAO. In both phases national counterpart scientists were actively involved and most of them were given training abroad as well as on the job.

The purpose of the Project was defined as: to assist through resources surveys in the development of sardine and mackerel fisheries on the southwest coast and in particular:

(a) assess the abundance of the sardine and mackerel stocks and their fluctuations, and study their spatial and temporal distribution in relation to the environment and consequential changes in the availability of fish to the fisheries;

(b) study the life history of sardines and mackerel including migration, reproduction, growth and mortality;

(c) study the behaviour of these species with special reference to the efficiency of tactics and methods of fishing, and

(d) conduct fishing experiments for purpose of finding efficient methods and gear.

However, during the actual survey operations, several other significant pelagic and column resources, mainly whitebaits, catfish and ribbon fish came to the notice of the Project and all these were included in the survey.

After the first phase of operation it was decided to extend the Project for a period of three years (1976-79) as a second phase, not only to continue the stock assessment activities but to include exploitation and utilization aspects, to lay a foundation for development as follows:

(a) to fill in the gaps in knowledge on the biological and behavioural characteristics of the oil sardine and mackerel resources;

(b) to develop more precise estimate of the size and location of the pelagic resources in the Project area;

(c) to establish methodologies appropriate to Indian conditions for stock assessment and forecasting;

(d) to set up a stage to continue the work of monitoring and forecasting pelagic fish resources on a regular basis;

(e) to determine the types of boats, gear and fishing methods necessary for efficient and economic exploitation of the pelagic resources, and

(f) to determine for industrial application, the most economic ways of handling, preserving, utilizing and marketing pelagic fish as well as the supporting facilities necessary for the fishing fleet.

Project Formulation

The Project formulation appeared to be on sound basis. It may be stated that a project like this should have a framework of action plan to start with and always drawbacks could be observed and countered by appropriate changes. This had to be done during the working of the Project as seen from the change-over from integrator surveys for sardine and mackerel to sonar surveys and aerial surveys.

Expenditure of Resources

Duration February 1971 to end 1975

Expatriate staff	Number	m/m
Project Managers	2	61
Biologists	3	58
Acoustic Experts	4	84
Skippers	4	93
Masterfishermen	2	
Marine Engineers	4	98
Consultants	11	15
National staff		
Project Director	1	58
Biologists	6	197
Oceanographer	1	53
Electronic Engineer	1	26
Skippers	5	110
Marine Engineers	5	69
Administrative Officer	1	45
Fellowships (1971 and 1972)	5	38

Costs in US$ equivalent

Government	993 000
UNDP	1 898 700
Norway	500 000
Total approximately	3 391 700

Reporting

Technical progress reports

	Nos.	Year issue
	1	1971
	1	1972
	3	1973
	3	1974
	3	1975
	8	1976
Total	19	

Cruise reports

Nos.
5

Various technical publications

Nos.	Year issue
1	1972
4	1973
3	1974
3	1975

Field documents

Nos.	Year issue
5	1980

Operations

Two research vessels - R/V SARDINELLA, a 54 ft fibreglass trawler/purse seiner (153 hp) and R/V RASTRELLIGER, a 152 ft steel stern ramp trawler/purse seiner (1 320 hp), carried out the acoustic/oceanographic/ichthyoplankton surveys and some exploratory fishing activities. Both the vessels were equipped with full acoustic instrumentation including echo sounders, sonars and echo integrators. Acoustic surveys along with experimental fishing were the major techniques employed for the assessment of the resources. Aerial surveys were specially conducted in 1972, 1973 and 1974 and sonar surveys subsequently for assessing near surface schools of sardine and mackerel resources. One aerial survey was carried out in 1978 for estimating the concentrations of fishing effort in the Project area. Environmental studies were carried out by regular monitoring of oceanographic parameters and plankton biomass at prefixed sections in the Project area. The plankton samples were particularly studied for abundance and distribution of fish eggs and larvae of commercial pelagic species.

Exploratory and experimental fishing were conducted by both Project vessels simultaneously during acoustic surveys, and also during separate cruises. R/V RASTRELLIGER did mostly demersal trawling (normal and rough bottom) and mid-water trawling, in the latter case the most successful being for whitebait. R/V SARDINELLA did bottom and mid-water trawling, as well as purse seining. Other activities included demonstration of pair trawling with 32 ft vessels and collaborative activities with the Integrated and Exploratory Fisheries Project. Work on utilization aspects included the installation and operation of a small imported canning plant at the Integrated Fisheries Project, installation of a chilled sea water unit in a sardine "carrier boat" and "Mediterranean style" salting experiments of sardines.

2. THE IMPACT THAT AID PROGRAMMES HAD ON IMPROVEMENT OF THE KNOWLEDGE OF LOCAL FISHERY RESOURCES - NAMELY THEIR NATURE, THEIR POTENTIAL YIELDS AND THE MAIN FEATURES OF THEIR REACTIONS TO VARIOUS EXPLOITATION REGIMES

Assessment of Stocks

The assessment of fish stocks by acoustic methods was attempted for the first time in India. The echo integrator survey, which was the main tool in this respect, had its limitations in assessing oil sardine and mackerel resources as most of the surface and subsurface schools of these fish were outside the scanning of the echo sounders. However, echo integrator surveys were useful in assessing resources of catfish, ribbonfish, whitebaits (Stolephorus spp.) and horse mackerel, a large part of which are column dwelling. Sonar and aerial surveys were more useful in the assessment of oil sardine and mackerel resources.

The acoustic/aerial survey methodologies incorporated instrumentation and field techniques, currently under experimentation and trials in different parts of the world and assessment of standing stocks of tropical fish sometimes with considerable intermix of species appeared to have limitations especially in terms of the absolute values arrived at.

The average estimated standing stocks of the important pelagic/column fish resources of the Project area were as follows:

Resources	Estimated standing stock (1972-78) (000 t)	Average annual catch for Project area (1972-77) (000 t)
1. Whitebaits	275	14
2. Mackerel	73-185	62
3. Horse mackerel	110	-
4. Catfish/ribbon fish	160	50
5. Sardines	188-770	146

Nos. 1, 3 and 4 - average based on echo integrator surveys 1972-78
Nos. 2 and 5 - based on aerial survey 1972-74 and sonar surveys 1975-78

The level of exploitation of the above resource are, judging from the relationship between mean annual catches and mean population biomass, well below the optimum rates particularly for, e.g., whitebait which is literally an untapped resource. Whitebaits were found to be present in good concentrations on the western shelf between October/November and May/June and accumulating in dense concentrations in the Gulf of Mannar during June/July to September/October.

The catfish/ribbon fish resources in the Project area were mostly concentrated around 30 m depth.

The horse mackerel resources consisting of the true horse mackerel (Megalapsis cordyla) and the scads (Decapterus spp.) were found in good concentrations mainly on the middle and outer shelf during October/December and April/July period.

Environmental studies have clearly shown that the whole seasonal patterns of production along the southwest coast of India are triggered by the phenomenon of 'upwelling'. During the southwest monsoon period, the nutrient laden cool waters of the deeper shelf circulate upward and toward shore, causing a phenomenal growth of plankton in the shelf waters. The peak period of breeding of the major pelagic fish coincides with this natural production cycle, so that the young fish thrive on the plankton and immigrate into the areas of production in the inshore waters.

It is indicated that the upwelling on the southwest coast shelf, its intensity and duration is of prime importance, influencing the level of production, breeding and survival of the major pelagic species and a seasonal study of this phenomenon might provide the basis of forecasting the annual fisheries.

Life History Studies

Replicated egg and larval surveys in time and space in the Project area revealed a lot of information on the spawning of several commercial species.

The data collected have shown that the oil sardine, mackerel, whitebaits, tunas, horse mackerel and scads largely spawn over the shelf for protracted periods. No sharply defined spawning grounds could be delineated for these species, except for concentrations of the larvae south of 12°N Lat. Oil sardine, whitebaits, as well as mackerel spawned throughout the year with the dominant period during the southwest monsoon (May/August).

The major spawning periods of these fish have been found to be aligned to the production cycle triggered by the upwelling in the area.

Study of the Behaviour of Oil Sardine and Mackerel with Special Reference to Efficiency of Tactics and Methods of Fishing and Conduct of Fishing Experiments for the Purpose of Finding Efficient Methods and Gear

The above aspects were covered by the fishing activities of the Project as well as of the collaborating agencies like the Integrated Fisheries Project (IFP).

It was demonstrated that purse seining is ideally suited for catching mackerel and oil sardine. The economics of operation indicated that vessels of 40-50 ft to be most viable and efficient. High opening bottom trawls were found effective for catching catfish and ribbon fish and also at times horse mackerel. Mid-water trawl was found effective for whitebait. Apart from these generalizations, no concrete results seem to have been achieved in this direction. The large vessel of the Project (152 ft) appears to have been less useful in fishing experiments.

With regard to the objectives of the second phase, it may be stated that the second phase activities did not contribute much to the results except tacitly reiterating the first phase results.

Regarding assessment and forecasting methodologies for Indian conditions, no clear recommendations seem to have been made. However, the following have emerged from the overall work of the Project: (a) sonar and aerial surveys are more suitable for sardine and mackerel stock assessment than integrator survey; (b) study of upwelling - its duration and intensity may help to forecast the major pelagic fisheries subsisting on the annual production cycle, and (c) pre-fishery young fish surveys might help to clarify relative abundance of the fishable stock.

Regarding determination of types of boats, gear and fishing methods necessary for efficient and economic exploitation of the pelagic resources, no important conclusions have been drawn other than general indications.

The utilization aspects have been studied in the second phase from the point of using the pelagic species for producing different canned products.

A small imported canning plant was installed at the Integrated Fisheries Project and experimentation on production of several canned products conducted. The plant is expected to help in producing different types of canned fish products for demonstration and for exploring market potentials. Experiments in preparing "Mediterranean type" of salted rolled sardine fillets were conducted.

Marketing

Only preliminary surveys have been conducted to assess market preferences.

Not much headway has been made in certain aspects like handling the fish on board in boxes, etc. However, some demonstrations in fish handling in boxes and installation of a sea water chilling unit in a sardine carrier boat have been made.

3. THE CONTRIBUTION OF THE PROJECTS TO THE USE MADE OF THE INFORMATION GENERATED ON THE FISH RESOURCES IN DEVELOPING AND MANAGING NATIONAL FISHERIES

The surveys carried out by the Project assessed the average standing stocks of the major pelagic fishery resources of the southwest coast of India and revealed the underexploited nature of some of these resources. This has given added confidence for the introduction of mechanized fishing in pelagic fisheries. Already in the Karnataka State in the Project area, over 200 medium-size purse seiners have been introduced for oil sardine and mackerel fisheries. In Kerala State also mechanization of pelagic fishing has been taken up seriously. However, due to the present social conditions and educational backwardness of the traditional fishermen, some of these schemes have not made much headway on account of lack of favourable response from traditional fishermen to the introduction of large-scale mechanization in pelagic fishing.

Mid-water trawling for column species has been adopted on a small scale by the conventional shrimp trawlers during off season along the Kerala coast.

The environmental studies, particularly on upwelling, have indicated a direct link with upwelling and the production cycle in the area and it is hoped that in future monitoring of the intensity and duration of upwelling will be of help in fishery forecasts.

Egg and larval surveys for the first time clarified the situation regarding the spawning time and spawning grounds of the important pelagic species in the area. Planning of future spawning surveys has been made easier through the information gathered at present. Young fish studies conducted also added to the information on distribution of the young of some of the commercial species, especially the mackerel, prior to the fishing season.

Methodology

The methodology and technology employed have been quite new for the country as far as the acoustic survey was concerned, while other aspects of the studies were common technologies appropriate and relevant to the country's own expertise. In the case of application of acoustics for fish resources surveys in the country, a limited number of scientists involved in the Project's work have now attained the expertise to run such programme with little outside help. However, this technology being imported and in the process of continuous development, it may be necessary to induct some outside help for some more time. It will also take more time for a larger number of scientists to be trained for taking up surveys of larger magnitude.

Implementation

The implementation as far as the first phase was concerned, was more or less on the right lines and obtained the expected results. In the second phase, no new light was thrown on resources.

It may also be stated that study of behaviour of the species with special reference and efficiency of tactics and methods of fishing was not carried out seriously and hence no results obtained. Fishing experiments conducted did not give any outstanding information other than that generally known in other parts of the world and the results achieved have not specially demonstrated conclusively the large-scale commercial catchability of the resources.

At the moment facilities for handling large quantities of fish at sea and ashore are not adequate and the Project as well as some of the corporate fishing companies have faced problems in handling the occasional large catches.

The post-harvest technology for handling pelagic fish was only touched upon during the second phase, with some experiments in canning of pelagic fish and setting up of a small canning plant. While canning technology may be developed as a second priority, the handling and utilization aspects of large catches of small pelagic fish within the country, to meet the deficit protein requirements, should have received more attention.

4. CONTRIBUTION TO THE STRENGTHENING - IN SCOPE, NUMBER AND QUALITY - OF THE NATIONAL SCIENTIFIC SKILLS AND TO THE EVENTUAL ESTABLISHMENT AND DEVELOPMENT OF NATIONAL RESEARCH INSTITUTIONS

From the inception of the Project, national counterpart scientific staff have been inducted in the various disciplines of work. The candidates recruited initially were almost all from the Central Marine Fisheries Research Institute (ICAR). All of them were middle-level scientists with experience in the respective disciplines of work. They were given further advanced training, especially in acoustic surveys, ichthyoplankton surveys, oceanography, electronic engineering, computer technology and computer operation. These staff have now attained sufficient expertise to take up responsibilities independently in their fields of work. Services of most of the counterpart staff who worked in the Project are now being utilized by the national fishery research institutions. In addition to the training of the scientific staff, several batches of ship staff, like deck and engine crew, have been given on-board training in handling modern fishing gear and in running of a research-cum-exploratory fishing ship. The contribution of the Project in training the national scientific and technical staff appears to be noteworthy.

5. THE AID PROVIDED IN THE DEVELOPMENT OF LOCAL FISHERY RESEARCH FACILITIES (INSTITUTION, RESEARCH VESSELS, EQUIPMENT, ETC.)

The facilities instituted for the working of the Pelagic Fishery Project were mainly the two research vessels (152 ft and 54 ft) and the acoustic and fishing equipment which came along with them. These vessels with the on-board scientific and fishing equipment are being reverted to FAO. However, some residual facilities like the electronic workshop, some fishing gear and a mini computer are expected to be handed over to the national institution continuing the work of the erstwhile Pelagic Fishery Project. Some equipment like calculators, typewriters, etc., stand transferred to the Government already. The canning plant installed at the Integrated Fisheries Project is able to continue operation, subject to availability of suitable cans.

The equipment and material aid given for the continued development of local research facilities are only minimal and limited to some of the residual items in stock at the closure of the Project.

6. POLICY - CONCLUSIONS REGARDING:

6.1 Objectives

It is well known that the demersal fishery along the coast of India is more or less intensively exploited and the studies carried out by national institutions have established beyond doubt that any substantial increase in the fish catch could be only from pelagic, meso and bathypelagic species. Occasional surveys carried out have also indicated the fact that appreciable quantities of pelagic fish, like oil sardine and mackerel are available in the regions beyond those fished by traditional, non-mechanized fishing units. Therefore, the objectives of the two phases in which the project was implemented are highly relevant and timely for the development of fisheries along the coast of India. Also, the declaration of the 200-mi Exclusive Economic Zone by the Government of India, in the meantime made it imperative that a more intensive and extensive resources assessment should be carried out for evolving appropriate management policies.

While the objectives laid down for the first phase have been fairly well achieved, those of the second phase have not been satisfactorily met. The activities of the second phase did not contribute substantially to the knowledge already gathered during the first phase, except reiterating the results. In regard to the various aspects relating to post-harvest technology contemplated during the second phase, such as industrial application of the most economic way of handling, preserving, utilizing and marketing of pelagic fish, it may be mentioned that a small canning plant was installed which is expected to help in producing different types of canned fish products for exploring market potentials. Considering the fact that canning, using either conventional tin plates or aluminium sheets, is expensive in India, it would have been more appropriate if some other cheaper, yet efficient and dependable methods of processing the fish, were thought of and studied. The situation probably could have been remedied if there was a better appreciation of the domestic market demands and export potentials in competition with various other countries marketing canned products so as to evolve post-harvest technologies relevant to the prevailing economic conditions. The technology so developed must be simple enough to operate and cheap enough to ensure that they are self-sustaining and are capable of being replicated under local conditions. Similarly the information provided on the selection of types of boats, gear and fishing methods necessary for efficient and economic exploitation of the resources located, does not seem to have led to specific recommendations. Here again, specific identification of fishing units would have helped the industry to make investments without taking unnecessary risks.

6.2 Organization and Planning

In the matter of organization, the Project has been conceived on a sound basis. The planning also has been done with extreme care and inbuilt flexibility. The techniques and methodologies adopted in stock assessment, although sophisticated, are relevant to local conditions and lend themselves to continued use by the national agencies. Choice of a proper executing organization who has the minimum expertise and capability to carry out the programme and who could follow up the work at the end of the Project as part of its normal activity should be an important criterion.

6.3 Problems of Support and Execution

It has been the experience,in several cases, that a worthwhile project started with bilateral or international assistance collapses as soon as the external input is withdrawn. This could be attributed to various reasons. Inadequate support in terms of duration, inappropriate technologies resulting from introduction of highly sophisticated equipment and methodology, identification of the wrong organization as the national counterpart or problems faced by the national organizations, financial or otherwise, in the continued execution of the work. In many countries, lack of fully equipped research vessels for carrying out resources survey and assessment is a major constraint even if there are qualified scientists. This happens to be a problem in India also. Remedial measures are being taken and it is expected that adequate number of vessels will be available for resources assessment. However, the time lag could have perhaps been avoided if the Project support by way of research vessel and equipment was continued until such time as the national capability is developed for continuing the work.

In the formulation and execution of projects with external assistance, apparently no provision is made for monitoring the follow-up action taken by the national agencies. A mechanism for doing this, therefore, seems to be necessary and so also make provision for any marginal support that may be required for successful continuation of the activities until they become self-sustaining so as to ensure full impact of the results achieved in development and industry.

ANNEX 14

A Review of the Adequacy and Availability of FAO Manuals in Fisheries Science

by

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1. INTRODUCTION

At the ACMMR working group held in Svanøy, Norway on 2-8 September 1979, it was agreed that, as part of its future work, the group should undertake a critical review of FAO training in resources research and that this "should include an analysis of manuals prepared, their adequacy and availability in official UN languages and their dissemination".

This report is the first part of a contribution to this analysis. It examines the role of FAO manuals relating to resource research, reviews the presentation of these manuals and related documents, comments on their adequacy and makes some recommendations which the next meeting of the working group should consider.

The second part will be an analysis of a questionnaire (Annex 7 of the present report) which has been prepared and sent out to a considerable number of practising fisheries resource biologists in developing countries asking for information on the availability to them of FAO Manuals and related documents and for their views on their usefulness to them personally.

2. THE ROLE OF FAO MANUALS IN FISHERIES SCIENCE

In considering the role of the FAO Manuals in Fisheries Science, it is useful to start by knowing how their originators envisaged it. In the Foreword to the first Manual in Fisheries Science, issued in 1965, Mr R.I. Jackson, Director, Fisheries Division, explained how the manuals had been produced to meet needs expressed originally at meetings of the Indo-Pacific Fisheries Council for text books covering each of the aspects of the new science of fisheries. As the science was growing rapidly the need to avoid rigidity was recognized and he wrote "these manuals will ... not be text books in the usual sense of that term, but rather practical guides describing techniques and plans and presenting ideas and views on this science as at present have general currency". To permit ready updating, the manuals were to be issued in a loose leaf form.

Dr Kesteven, as general editor of the manuals, gave, in the Preface to the same volume, a brief account of the overall plan for the series. He wrote that the manuals were intended to be *vade mecums* of practical value to those engaged in fisheries research and for this reason a volume was to be devoted to each of the principal sections of work in which these researches engage. Thus, there will be volumes dealing, for example, with Laboratory Methods, Sampling, Gear Selectivity and Population Dynamics.[1/]

The manuals would, whenever possible, incorporate standard descriptions of methods and techniques and provide opportunities for promoting improvement and standardization of methods, equipment and terms. In order to ensure that each manual conformed with the current consensus of opinion on the theory and methods in its field, arrangements were being made to establish a panel of consultants who would examine the manuscripts and keep the need for future revisions under review.

[1/] Manual of field methods in fisheries biology, FAO Manuals in Fisheries Science No. 1, Rome 1960, 152 p. (first draft)

Although during the 20 years since the first manuals appeared, there has been a great expansion in the publication of journals in fisheries and a number of text books are now available, no other publications have come near to meeting the objectives of the original plan. Meanwhile, there has been a steady expansion of government laboratories in most countries of the world in which the primary objective is to undertake research leading to the understanding and the evaluation of their fishery resources and how to manage them. Added responsibility is falling on the resource biologists in both the developing and the advanced countries. The need for the type of reference books on accepted practices and methodology in resource research envisaged by the Manuals in Fisheries Science is, if anything, greater than when they started, especially in developing countries with large fisheries resources that have extended their fisheries limits and are urgently requiring to know more precisely the potential of the resources for which they now have full responsibility.

Fisheries science continues to grow rapidly and FAO and its publications have played a leading role in developing this science, particularly in relation to tropical seas and its use by developing countries. It is essential that FAO's various publications should continue to record the results of research, conferences, seminars and workshops and be a medium for the dissemination of new ideas. However, the manuals should play the different role of bringing together those ideas and methods that can be distilled from the wide body of experience under all the varied conditions from the tropics to the polar regions and have proved their value. The function of the manual is not to provide a review of the latest thinking, but reference books to those methods that have proved their value under the different conditions to be found throughout the world.

FAO Fisheries Technical Papers would be an important source of material for the manuals but should not be confused with them. Thus there would appear to be a very strong case for keeping the manuals as a distinct series of publications planned as such, with the practical user constantly in mind, remembering also that he or she may be reading a language that is not his/her mother tongue.

With regard to the more detailed coverage of the manuals, the requirements have not changed greatly, though, with the increased experience of resource research and the increasing number of stocks that are fully or overexploited, there is need for more emphasis on methods now available for stock assessment and the investigation of the effects of possible management measures, though the need for the determination of the basic parameters of growth, mortality rates and mixing between stocks is as great as ever.

The manuals should devote considerable space to the discussion of the pros and cons of the different methods for resource assessment that have been presented and should give references to national or other publications where the methods have been successfully used. Bibliographies in manuals could be very usefully anotated to help the reader select the references of greatest importance to him.

Being of particular importance to the developing countries, it is essential that the manuals cover fully the experience of research in the tropical and subtropical seas and include a substantial proportion of their examples from these areas.

The role of the manual is not primarily to provide material for training courses, though, if comprehensive and simply written, they would be invaluable background material for such courses. The importance of their being planned quite separately from training courses is discussed further in a later section.

3. EXISTING MANUALS: THEIR CONFUSED ORGANIZATION AND PRESENTATION

Between 1960 and 1972, FAO issued five manuals in a new series in quarto size and under the general title "FAO Manuals in Fisheries Science". These were:

M.1 Laevastu, T., 1965 Manual of methods in fisheries biology. FAO Man.Fish.Sci., (1):10 fasc. (E, F, S)[1]

M.2 Kesteven, G.L., 1960 Manual of fisheries science. FAO Man.Fish.Sci., (2):261 p. (E)

M.3 Gulland, J.A., 1966 Manual of sampling and statistical methods for fisheries biology. Part 1. Sampling methods. FAO Man.Fish.Sci., (3):87 p. (E, F, S) (priced) (revised edition of FAO Fisheries Technical Paper No. 26, 1962)

M.4 ____________, 1969 Manual of methods for fish stock assessment. Part 1. Fish population analysis. FAO Man.Fish.Sci., (4):154 p. (E, F, S) (priced) (revised edition of FAO Fisheries Technical Paper No. 40, rev.2, 1963)

M.5 Forbes, S.T. and O. Nakken (eds.), 1972 Manual of methods for fisheries resource survey and appraisal. Part 2. The use of acoustic instruments for fish detection and abundance estimation. FAO Man.Fish.Sci., (5):138 p. (E, F, S) (priced)

Only the latter three manuals were priced.

Manuals Nos. 3 and 4 had been issued in provisional form in the FAO Fisheries Technical Papers (FTP) in 1962 and 1963 before being revised and published in the Manuals series. Although this series has not been discontinued and several titles have been reprinted, no new title has been added to the series after the issue of No. 5 in 1972. Nos. 1 and 2 are out of print. However, the concept of the Manuals was continued and new ones have been published in the FTP series, the majority having the word 'manual' in the title. These new manuals in the FTP series do not come under one general heading as manuals, but under four headings, similar to but not quite the same as those used for titles in the discontinued series. The documents on resource research with 'manual' in the title, but published in the FTP series are as follows:

Manual of Fisheries Science

Kesteven, G.L., 1973 Manual of fishery science. Part 1. An introduction to fishery science. FAO Fish.Tech.Pap., (118):43 p. (E, F, S)

Holden, M.J. and D.F.S. Raitt (eds.), 1974 Manual of fishery science. Part 2. Methods of resource investigations and their application. FAO Fish.Tech.Pap., (115)Rev.1: 214 p. (E, F, S)

Manual of Sampling and Statistical Methods for Fisheries Biology

Anderson, K.P., 1965 Manual of sampling and statistical methods for fisheries biology. Part II - Statistical methods. Chapter 5:Computations. FAO Fish.Tech.Pap., (26)Suppl.1: 25 p. (E)

Hall, W.B., 1968 Manual of sampling and statistical methods for fisheries biology. Part II - Statistical methods. Chapter 6:Continuous distributions. FAO Fish.Tech.Pap., (26)Suppl.2:36 p. (E)

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[1] E (English), F (French) and S (Spanish) indicate in which of the UN official languages each manual was published. M.1 was also published in Portuguese by the Portuguese Government

Manual of Methods for Fish Stock Assessment

Beverton, R.J.H. and S.J. Holt, Manual of methods for fish stock assessment. Part II -
1966 Tables of yield functions. FAO Fish.Tech.Pap., (38)Rev.1:67 p. (E, F, S)

Pope, J.E., et al., Manual of methods for fish stock assessment. Part III - Selectivity
1975 of fishing gear. FAO Fish.Tech.Pap., (41)Rev.1:65 p. (E)

Jones, R., Manual of methods for fish stock assessment. Part IV - Marking. FAO Fish.Tech.
1966 Pap., (51)Suppl.1:94 p. (E, F, S)

Manual of Methods for Fisheries Resource Survey and Appraisal

Alverson, D.L., Manual of methods for fisheries resource survey and appraisal. Part 1.
1971 Survey and charting of fisheries resources. FAO Fish.Tech.Pap., (102):80 p. (E)

Mackett, D.J., Manual of methods for fisheries resource survey and appraisal. Part 3.
1973 Standard methods and techniques for demersal fisheries resource surveys. FAO Fish.Tech.Pap., (124):39 p. (E)

Gulland, J.A., Manual of methods for fisheries resource survey and appraisal. Part 5.
1975 Objectives and basic methods. FAO Fish.Tech.Pap., (145):29 p. (E)

It is seen that, while the numbering of the above manuals leaves places for Manuals 3, 4 and 5 in the series of Manuals, no place is left for Manuals 1 and 2. Manual 3, Part 1 "Sampling methods" with its five fascicules does not quite tie up with Part II "Statistical methods" as FTP 26, supplements 1 and 2, with their chapters 5 and 6. Manual 2 has the same general title as the first two technical papers above - Manual of fisheries science - but they are not integrated numerically. This partial tie-up between the two series leads to considerable confusion for anyone trying to establish what manuals exists.

In addition a place has been left for Part 4 of the "Manual of methods for fisheries resource survey and appraisal", which it appears was to have dealt with fish egg and larval surveys, though when this document was published as FTP 175, it bore no reference in its title to the rest of the manuals.

The last FTP with the word 'manual' in its title was published in 1975. However, in addition to the ten documents above in the FTP series, several documents have been published in the FTP series, which either say that they are manuals in the preface or introduction (FTPs 171, 191 and 133) or in the prefactory note headed "Preparation of this paper" (FTP 153). These documents are therefore not allocated to one or another of the four manuals above.

These 'manuals' which do not have the word manual in their titles, are the following:

Bazigos, G.P., The design of fisheries statistical surveys - inland waters. FAO Fish.Tech.
1974 Pap., (133):122 p. (E, F)

__________, Applied fishery statistics. FAO Fish.Tech.Pap., (135):164 p. (E, F, S)
1974

__________, The design of fisheries statistical surveys - inland waters. Populations in
1976 non-random order, sampling methods for echo surveys, double sampling. FAO Fish. Tech.Pap., (133)Suppl.1:46 p. (E)

Burczynski, J., Introduction to the use of sonar systems for estimating fish biomass. FAO
1979 Fish.Tech.Pap., (191):89 p. (E)

Jones, R., The use of marking data in fish population analysis. FAO Fish.Tech.Pap., (153):
1976 42 p. (E)

Saville, A., Survey methods of appraising fishery resources. FAO Fish.Tech.Pap., (171):76 p.
1977 (E, F, S)

Smith, P.E. and S.L. Richardson, Standard techniques for pelagic fish egg and larval surveys.
1977 FAO Fish.Tech.Pap., (175):100 p. (E)

The intention that these or at least some of them should be considered to have the function of manuals is shown by the statement in the introduction of FTP 171, that it was written largely to update and replace manuals FTP 102, FTP 124 and FTP 145. On the other hand, FTP 191 on the use of sonar systems for estimating fish biomass covers much of the material in the original Manual 5 by Forbes and Nakken, but nowhere makes reference to that manual, except for its inclusion in the bibliography.

This lack of continuity of series or titling or of general policy adds to the confusion. The future of the manuals is under consideration within the Fisheries Resource and Environment Division, but no policy has yet been formulated.

4. AVAILABILITY OF THE MANUALS IN UN OFFICIAL LANGUAGES

The official UN languages have been English, French and Spanish until 1979, when Chinese and Arabic were added. In considering the availability of the manuals in UN official languages we will be concerned only with the former three, no manual or related document having been prepared or translated in the latter two languages as yet.

Although this analysis might strictly be limited to the 15 parts of manuals with that word in their titles, the six that state in the text, but not in their titles, that they are considered to be manuals, have been included.

The following table sets out the years of publication of each title and the languages in which it was published.

	Year of publication																	
	60	61-64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	Total
Manual series		NIL																
Number Languages	M.2 E				M.1 EFS	M.3 EFS	M.4 EFS			M.5 EFS								
FTP manuals																		
Number Languages			26 E	38 EFS		51 EFS			102 E		118 EFS	115 EFS	41 E					
Number Language											124 E		145 E					
FTP non-manuals																		
Number Language												133 E		153 E	175 E		191 E	
Number Languages												135 EFS			171 EFS			
E	1		1						1		1	1	2	1	1		1	10
EFS				1	1	2	1			1	1	2			1			10
Total																		20

These data can be summarized as follows:

	E only	E, F, S	Total	% in E, F, S
Manuals	1	4	5	80
FTP manuals	5	4	9	44
FTP non-manuals	4	2	6	33
Total	10	10	20	≃ 50

It is seen that, of the original five Manuals in Fisheries Science published between 1960 and 1972, all were published in English and four (80 percent) were also published in French and Spanish.

Of the nine manuals published in the FTP series between 1967 and 1975, all were published in English and four (44 percent) also in French and Spanish.

Of the six additional 'manuals' published from 1974 onwards all have been available in English, but only two (33 percent) also in French and Spanish.

All the publications available in French or Spanish are also available in English.

Manual 3 on sampling methods was also published in Portuguese by the Portuguese Government and it is possible that some other manuals have been published locally in languages other than those in which they are available from FAO.

Although the numbers are small, there has been a definite decrease in the proportion of these documents being issued in languages other than English.

5. EXISTING MANUALS: THEIR COVERAGE AND CONTENT

In view of the somewhat confused organization and coverage of the existing 'manuals' described in Section 3, it would seem most useful to present a layout based on the original concept (which is still prevailing) of presenting the accepted methods used in the various sections of the work in which fisheries research engages, but altering the coverage of the different manuals slightly to make them fully comprehensive without overlapping. This does not require substantial changes, but provides a basis against which to discuss the adequacy of the coverage and content of the present manuals. Such a proposed layout is presented below.

Manuals of Methods in Fisheries Science

Titles	Coverage (in one or more sections)
(a) Introduction to Fisheries Science	Brief history of the development of fisheries science. Its nature and objectives. Relationships between parts and to other sciences. Socio-economic background. Relation between research and management. Organization of fisheries research and relation to other research organizations, universities and teaching.

(b)	The Routine Collection of Fisheries Statistics	The routine collection of data on the catch, effort, marketing, processing and other socio-economic factors of the fishing industry. To include the planning, collecting, processing and presentation of such data.
(c)	Statistical Methods in Fisheries Research	Sampling the catch on research vessels and in markets, etc. Measuring and weighing. Probability theory and significance of differences. Graphical presentation of data. Commonly used statistical manipulations all well illustrated with fisheries examples.
(d)	Methods in Fisheries Biology	Species identification, identification of stocks, migrations, age and growth, mortality rates, spawning areas and timing, recruitment, food intake and feeding behaviour, inter-relation between species.
(e)	Stock Assessment	Surveys: fish eggs and larvae, benthos, demersal fish, pelagic fish, acoustic methods; selectivity of gear; measurement of fishing effort; yield curves: surplus yield models, analytical models; multispecies fisheries; inter-relationships between species; monitoring.
(f)	Management	Objectives, options, monitoring, enforcement; joint ventures, bilateral agreements.

Each of the above six sections are now taken in turn and the extent to which the existing manuals and related documents fulfil the needs in the field is briefly discussed.

(a) Introduction to Fisheries Science

Existing manuals and related documents.

Kesteven, G.L., Manual of fishery science. Part 1. An introduction to fishery science.
1973 FAO Fish.Tech.Pap., (118):43 p.

Kesteven's FTP 118 is a comprehensive and valuable introduction presenting in considerable depth the nature of fisheries science, its parts and its relationships to science in general. It describes unit fisheries, assessment models and the choice of research projects and the application of the results of fisheries science.

There are few criticisms on content; however one aspect not touched on which could usefully be covered is the relationship between government fisheries science and the teaching and research in the universities. Another general topic useful to expand here is the relative importance of research into specific parameters (growth rates, mortality rates, migrations, recruitment) of individual species and research into the relationships between species, groups of species and the environment.

The introduction to fisheries science should not only give the broad backcloth of the less controversial mechanisms which constitute the science, but should raise some of the more controversial issues of the time. This would bring the volume more alive.

An important readership of the manuals should be the younger fisheries scientists of the developing countries, for many of whom the FAO languages are not their mother tongue and whose vocabulary in these languages tends to be somewhat limited. In this respect this manual has some limitations as it is not everywhere easy to follow, especially when unusual phrases or words are used, such as 'apositely recollective' (page 1), 'significate' (page 1), 'adult oionomorph' (page 5), 'paradigm' (page 8), 'aionomorphic modules' (page 31).

(b) The Routine Collection of Fisheries Statistics

Existing manuals and related documents include:

1. Anon., 1979 Draft proposals for statistical standards, fishing craft, fishing gears, fishing effort. Memo prepared by Fisheries Information, Data and Statistical Service. (Mimeo):53 p. (E)

2. Bazigos, G.P., 1974 Design of fisheries statistical surveys - inland waters. FAO Fish.Tech. Pap., (133):122 p. (E, F, S)

3. Brander, K., 1975 Guidelines for collection and compilation of fishery statistics. FAO Fish. Tech.Pap., (148):46 p. (E)

Up to the present the collection of fisheries statistics has not been included in the coverage of the formal manuals, although the paper by Bazigos is described in the preface as manual. There is little doubt that a manual on this topic is greatly needed to assist in getting the best statistics, on which so much of fisheries resource research depends.

The manual that is required should be written largely for the use of those government statistics groups or others in developing countries who are responsible for the design of schemes for the collection, compilation and publication of fisheries statistics. The manual should cover all the ground in Brander's paper but should discuss in greater detail the problems of choosing the most suitable sampling frames when a full collection of data from every landing is not possible. It should give plenty of examples drawn from the work of Banerji, Yamamoto, Chakraborty and others. Brander's paper does not discuss sufficiently the problems of the developing countries in which the fish resources are either rather limited (many southern and eastern African countries) or of major importance, but artisanal and scattered along a great length of coast (e.g., Indonesia, Philippines). While referring in passing to periodic fisheries censuses, the importance and the practical carrying out of such censuses is not adequately covered.

Important items to be covered by such a manual are the International Standard Statistical Classifications of boats, fishing gear and fish, which are included in Item 2 above.

The paper by Bazigos (FTP 133) is geared specifically to inland waters; it was prepared for training courses at elementary, intermediate and advanced levels and is not suitably arranged for the manual that is required for marine fisheries.

A manual of methods covering the needs of developing countries would have to be prepared from scratch, but would fill a very real need.

(c) Statistical Methods in Fisheries Research

Existing manuals and related documents include:

1. Gulland, J.A., 1966 Manual of sampling and statistical methods for fisheries biology. Part 1. Sampling methods. FAO Man.Fish.Sci., (3):87 p. (E, F, S)

2. Anderson, K.P., 1965 Manual of sampling and statistical methods for fisheries biology. Part II - Statistical methods. Chapter 5: Computations. FAO Fish.Tech. Pap., (26)Suppl.1:25 p. (E)

3. Hall, W.B., Manual of sampling and statistical methods for fisheries biology. Part II - 1968 Statistical methods. Chapter 6:Continuous distributions. FAO Fish.Tech. Pap., (26)Suppl.2:36 p. (E)

4. Bazigos, G.P., Applied fisheries statistics. FAO Fish.Tech.Pap., (135):164 p. (E, F, S) 1974

Gulland's manual on sampling methods covers very fully and clearly the practical aspects of sampling the commercial landings and research vessel catches, and also has a short section on the calculation of means, modes, medians and standard deviations. Anderson's and Hall's chapters cover fully and simply the rounding off, grouping, estimation of errors in field data and the handling and presentation of continuous series of data. All three deal with their material in a very practical way.

Bazigos' FTP 135 "Applied Fisheries Statistics" is written for workers in freshwater fisheries research and the many worked out examples are from this field. It covers the graphical presentation of data and a large range of standard statistical techniques used in biological research. It assumes no previous knowledge of statistics but also implies a ready facility to think in symbols and equations. There are therefore some sections that are not easy to follow.

It can be argued that there is no need for a manual covering standard statistical techniques, as there are many text books on statistics for biologists. However, in many of the smaller fisheries laboratories of the world such books are not present and they are difficult to obtain locally and are not directed to the needs of fisheries biologists. Also the use of carefully chosen examples from fisheries research in different parts of the world would no doubt be of real value in reducing the resistance that many young biologists still have to mathematics.

While the four documents above cover the ground required, they need integrating to avoid duplication and to fill a few gaps while the section on statistical methods needs some revision to make it more explicit and to include examples from marine fisheries.

(d) Methods in Fisheries Biology

1. Laevastu, T., Manual of methods in fisheries biology. FAO Man.Fish.Sci., (1):10 fasc. 1965 (E, F, S)

2. Holden, M.J. and D.F.S. Raitt (eds.), Manual of fishery science. Part 2. Methods of 1974 resource investigations and their application. FAO Fish.Tech.Pap., (115) Rev.1:214 p. (E, F, S)

3. Jones, R., The use of marking data in fish population analysis. FAO Fish.Tech.Pap., 1976 (153):42 p. (E)

4. Gulland, J.A., Manual of methods for fish stock assessment. Part 1. Fish population 1969 analysis. FAO Man.Fish.Sci., (4):154 p. (E, F, S)

The existing manuals and related documents concerned with the biological investigations in fisheries research have separated the methodology on board the research vessel, on the dockside and in the laboratory from the determination of the parameters used in stock assessment. Documents 1 and 2 above deal largely with practical methods with little reference to the determination of growth rates, mortality rates, recruitment, etc., for which many of the biological observations are required. Thus there is a divorce between the main objectives of the work and the field observations required to achieve those objectives, thus perpetuating the unhelpful concept that it is necessary to study the biology of the various fish before and separate from the research leading to the evaluation of the resources and the effect of fishing on them. It also leads to a failure to study the interaction between species and species groups.

On the other hand, Gulland's manual of methods for fish stock assessment (No. 4 above) includes sections on growth, mortalities and recruitment as the lead into stock assessment and makes little reference to the biological observations needed to determine these parameters.

This division has encouraged the separation of the work on stock assessment from the biological investigations, while the need is for the assessment work to be closely linked with and based on knowledge of the biology of the fish, quantitative assessment of the parameters and knowledge of the fisheries.

The manual on Methods in Fisheries Biology needs to be firmly based on the determination of the parameters in resource assessment supplemented by those other biological studies needed to help to understand the population dynamics of species, groups of species and the total resources of the seas. The main divisions of this manual would probably be:

Identification of species;
Identification of stocks and migrations;
Age and growth;
Fishing and natural mortalities;
Spawning areas and time of spawning;
Maturity and fecundity;
Recruitment;
Food and feeding, and
Interrelationships between species.

In all sections of this manual many references should be given to examples in the literature where the methods described in the manual have been successfully used in practice.

Laevestu's manual (No. 1) deals strictly with field methods, is now out of date and out of print and most of the methods have been included in the manual by Holden and Raitt (No. 2).

Holden and Raitt's manual, while comprehensive, fails, as outlined above, by dealing with the biological research divorced from the determination of the parameters required for resource assessment. This manual was based on a very comprehensive training course (Denmark 1972) and has the limitations of many of the FAO/DANIDA training courses of the 1960s and early 1970s, that it inadequately deals with the issues that are important in tropical areas but of less importance in temperate seas. It also covers a number of topics that should be in other manuals, for example, sampling, collection of fisheries statistics, surveys and stock assessment.

Jones' paper on marking (No. 3) is concerned with the mathematical analysis of tagging experiment results to provide estimates of population numbers, mortality growth and dispersion. It is not concerned with the planning or methodology of such experiments. The material from this paper needs to be split into sections and each included under the appropriate parameter for which the method is used and the planning and execution of these experiments needs adequate treatment.

Only a little of Gulland's manual (No. 4) needs to go into the manual of methods in fisheries biology. However, the latter needs to be written so that the assessment of the parameters set out in it links easily with their use for resource assessment in the next manual - on Stock Assessment.

A separate section of this manual (so that it can be readily updated) could usefully be devoted to the description of equipment that has proved its value in fisheries research. Details of their use and limitations should be included, with note on their manufacture. Where appropriate the names and addresses of suppliers could be given.

Sections could include:

Measuring and weighing;
Coulter and other counters;
Bottom samplers;
Benthos separation;
Mesh gauges;
Tags and tagging equipment;
Plankton samplers and flow meters;
Aids to separating plankton;
Water samplers;
Measurement of temperature, salinity, depth, and
Current measurement, tide meters.

(e) Stock Assessment

This manual would conveniently be divided into two parts, one covering methods used in resource surveys and the other covering methods used in stock assessment and dealing primarily with the various models available. In this discussion these two aspects are considered separately.

(i) Resource surveys

1. Alverson, D.L., 1971 Manual of methods for fisheries resource survey and appraisal. Part 1. Survey and charting of fisheries resources. FAO Fish.Tech.Pap., (102):80 p. (E)

2. Forbes, S.T. and O. Nakken (eds.), 1972 Manual of methods for fisheries resource survey and appraisal. Part 2. The use of acoustic instruments for fish detection and abundance estimation. FAO Man.Fish.Sci., (5):138 p. (E, F, S)

3. Mackett, D.J., 1973 Manual of methods for fisheries resource survey and appraisal. Part 3. Standard methods and techniques for demersal fisheries resource surveys. FAO Fish.Tech.Pap., (124):39 p. (E)

4. Gulland, J.A., 1975 Manual of methods for fisheries resource survey and appraisal. Part 5. Objectives and basic methods. FAO Fish.Tech.Pap., (145):29 p. (E)

5. Burczynski, J., 1979 Introduction to the use of sonar systems for estimating fish biomass. FAO Fish.Tech.Pap., (191):89 p. (E)

6. Saville, A., 1977 Survey methods of appraising fishery resources. FAO Fish.Tech.Pap., (171):76 p. (E, F, S)

The four published parts of the "Manual of methods for fisheries resource survey and appraisal" (1-4 above) were unsatisfactory as their contents overlapped while important aspects were not covered. They also look at the topic from different angles in an unconnected way that does not help the user. These problems have been largely overcome in the paper edited by Saville in which he covers the whole ground in a coordinated way. Once more this document is based very largely on the experience of temperate and cold waters and deals only to a very limited extent with the problems which arise in planning and carrying out surveys by developing countries in tropical waters. It thus lacks the touch which would make it very useful to the biologists in the developing tropical countries who most desire this guidance.

While on the whole being very good, Saville's paper, in addition to needing more examples from tropical waters, omits a number of subjects of importance. These include the use of horizontal echo ranging (sonar) in conjunction with sounders and integrators, to take account of near surface pelagic fish. Also there is need for more attention to be given to the factors of importance in deciding the frequency of routine surveys of fish or shrimps for following the changes in abundance as fishing intensity changes.

The need is for this manual to be in two parts, one of which covers all methods used in resource surveys which, in practice, is by fishing and by acoustic methods and goes fully into the methodology of surveys by fishing, while the second part would deal only with the methods used in acoustic surveys into which it would go in considerable detail. Allowing for the comments made in the last paragraph, Saville's paper largely fills the needs of the first part.

The manuals by Forbes and Nakken and by Burczynski deal with acoustic surveys required for the second part.

Forbes and Nakken's manual is comprehensive, thorough and practical, but, being prepared originally for training courses in 1969 and 1971, is now in need of up-dating to include subsequent development and experience.

Burczynski's FTP 191, issued in 1979, makes no reference to the previous manual by Forbes and Nakken though it goes over much the same ground, omitting certain important fields, e.g., the use of sonar in conjunction with sounder and integrator, while including calibration with live fish, which had developed since the earlier manual was written. However, the description of this calibration with live fish is very superficial and theoretical and does not touch on the many problems which arise when actually carried out (e.g., the effect on target strength of keeping fish different periods before using them). This paper does not go at all into the practical problems of carrying out acoustic surveys to assess the quantities of fish present, though it covers very fully the basis of hydroacoustics and the sorts of calculations that have to be made when using this method.

While the technical papers of Saville and Burczynski cover much of the ground required, there is need for the manuals to be more closely related to the practical needs of developing countries when planning and carrying out resource surveys.

(ii) Stock assessment models

The main coverage of this manual would be to present the various manuals available for stock assessment, discuss their suitability and limitations under different conditions, discuss the calculations of the parameters used and explain how to use the different formulae and equations. However, there are two aspects of resource assessment that are of vital importance, but which fall between the headings so far used; these are the selectivity of fishing gear and the measurement and standardization of fishing effort. The measurement will also be included in the manual on the collection of fishery statistics. These two topics are too often neglected, as is the whole subject of knowing the characteristics of the fishing fleets, their fishing methods and their distribution relative to the stocks of fish. While there is a strong case for having a separate manual dealing with information about the fisheries, these two items are included as the first part of this manual.

Existing manuals and related documents include:

1. Gulland, J.A., 1969 Manual of methods for fish stock assessment. Part 1. Fish population analysis. FAO Man.Fish.Sci., (4):154 p. (E, F, S)

2. Beverton, R.J.H. and S.J. Holt, 1966 Manual of methods for fish stock assessment. Part II - Tables of yield functions. FAO Fish.Tech.Pap., (38)Rev.1:67 p. (E, F, S)

3. Pope, J.E., et al., Manual of methods for fish stock assessment. Part III - Selec-
   1975 tivity of fishing gear. FAO Fish.Tech.Pap., (41)Rev.1:65 p. (E)

4. FAO, Models for fish stock assessment. Partial translation to the annex to the report
   1978 of the Second FAO/CNEXO Training Centre on methods for fish stock assessment. Brest, France, 26 July-27 August 1976. FAO Fish.Circ., (701):122 p. (E, F)

5. Anon., Monitoring of fish stock abundance: the use of catch and effort data. A report
   1976 of the ACMRR Working Party on fishing effort and monitoring of fish stock abundance. Rome, Italy, 16-20 December 1975. FAO Fish.Tech.Pap., (155): 101 p. (E)

The selectivity of gear is well covered by documents Nos. 1 and 3 above, though with some duplication. The measurement of fishing effort is largely covered by documents Nos. 1 and 4 above, but as the latter is a report of an ACMRR Working Party and is composed largely of presented papers, the coverage of this topic in a manual would not use this report directly but draw on it and a number of other publications on this subject.

With regard to the use of models in stock assessment, Gulland's manual on "Fish Population Analysis" (document 1 above) is the only existing manual which deals with this subject in an at all comprehensive way. Gulland's manual, based largely on lectures given in training courses held in the 1960s, remains one of the best known and most used of the FAO fisheries publications by workers involved in resource research (see results of questionnaire, Annex 7) indicating the real need for a reference manual on this subject and showing that Gulland's manual fills at least an important part of this need.

Gulland's manual has a wide coverage, from an introduction to calculus, through the calculation of the various parameters of importance in stock assessment to the calculation of yield curves. While it will probably be useful to have this wide coverage of the mathematics of population analysis in one publication, much will be gained if, in a well-planned series of manuals, this manual deals less with topics more fully covered elsewhere and expands on the models themselves. In addition to describing the models it would discuss their appropriateness in different circumstances, their particular advantages, limitations and pitfalls, giving examples and extensive references to papers describing their use. The appropriateness of the models for use for different groups of animals needs to be discussed, e.g., demersal fish, multispecies fisheries, large pelagic, small pelagic, penaeid prawns and lobsters.

At present the only FAO publication that attempts to bring together a review of the different models is document 4, above, though again this is in the form of separate papers presented to a workshop.

The yield tables, tables of e^{-x} and the yield functions, currently published as FTP 38, rev. 1 (document 2 above) should continue to be published as a separate part of the proposed manual or as an appendix.

(f) Management

Up to the present the management of fishery resources, as such, has not been included in the manuals or the related documents, though it is clearly recognized that the main objective of resource assessment is to provide the information for management in its broadest sense.

An increasing number of technical papers and workshop reports, etc., have been published by FAO dealing with management questions (FTPs 70, 92, 106, 155, 161, 166, Indian Ocean Programme publications IOFC/DEV/71/4, 74/35) primarily from the assessment point of view. New thinking of this sort should remain as FTPs, etc., while accepted ideas in the field will be incorporated in the manual on stock assessment.

However, the extension of national fishing zones has resulted in the fisheries departments of many developing countries desiring to make fuller use of their fisheries resources and wanting advice on fisheries management.

It would therefore seem opportune to include a manual which is written primarily for fisheries administrators and setting out the present understanding and experience of fisheries management.

This manual, written for fisheries administrators in both tropical third world countries and the developed countries, would clarify the socio-economic objectives of management and review the types of options that may be available to the administration to achieve those objectives. It would also review the successes and failures of management to date and give guidance on joint ventures and bilateral agreements, etc., which are deeply concerning the administrators in developing countries with extensive fishery resources. Such a manual would need to include a brief outline of the theory of the exploitation of fish stocks and so give a background to the options. It should also have a section on the role of fisheries research and explain the necessity for adequate, accurate statistics of the fisheries, long-term monitoring and sufficient scientific staff of adequate capacity, if the administrators are to receive the technical advice they need for management.

At present the FAO reports which deal with management from this point of view include[1/]:

1. Gulland, J.A., 1974 Guidelines for fisheries management. IOFC/DEV/74/36:84 p. (E)

2. Crutchfield, J.A., *et al*., 1975 Joint ventures in fisheries. IOFC/DEV/75/37:83 p. (E)

3. Carroz, J.E. and M.J. Savini, 1978 Bilateral fishery agreements: a review of bilateral fishery agreements concluded as a result of the new regime of the oceans. *FAO Fish.Circ.*, (709):65 p. (E, F, S)

Much of the material required is included in document 1 above, while documents 2 and 3 deal with the special points of joint ventures and bilateral agreements.

6. CONCLUSIONS AND RECOMMENDATIONS

There is a continuing need for manuals covering the accepted methods in the practical application of fisheries science to the assessment of fishery resources, the evaluation of possible management measures and the monitoring of fisheries resources in relation to management. The manuals and related documents issued by FAO over the past 20 years have partly fulfilled this need but could be much more useful. While the use of material prepared for training courses has helped to get the manuals written, it has seriously contributed to the patchy and overlapping coverage in some fields in spite of the general plans for the coverage of the manuals that appear to have been formulated.

The present situation in which there is no clear separation between manuals and other technical papers and in which their coverage overlaps and is apparently uncoordinated, is not considered satisfactory.

[1/] After this report was written, two manuals or related documents have been prepared on the economic aspects of fisheries management, namely:

Pearse, H.P., 1980 The regulation of fishing effort. *FAO Fish.Tech.Pap.*, (197):82 p. (E, F)

CIDA/FAO/CECAF, 1980 Report on the CIDA/FAO/CECAF Workshop on Fishery Development, Planning and Management. Lomé, Togo, 6-17 February 1978. Rome, FAO, Canada Funds-in-Trust, FAO/TF/INT/180(b) CAN:484 p.

It is considered necessary and the time opportune for the preparation of a new series of manuals carefully planned to give an integrated coverage of the methods used in fishery resource investigations. Proposals for the coverage of the manuals is given in Section 5. This would overcome the duplication and omissions that now characterize the manuals and related documents and would bring them into a recognizable series that can be updated and added to from time to time without the confusion that exists now from the lack of unity in planning or titling.

The manuals should be prepared as such and not be based on material prepared for other purposes. If well prepared they will provide the background material needed for training courses which would be supplemented by notes, examples and exercises specifically prepared to meet the local needs of the expected participants of each course.

To achieve these objectives it would appear advisable to appoint an editorial group for the manuals, including Headquarters staff as well as research workers from advanced and developing countries, to ensure that the series is planned as a whole, that the coverage is of accepted methods but is up to date, meets the needs of developing countries and that steps are taken to up-date the various parts as the science develops.

At present one of the Headquarters staff in the Fisheries Resources and Environment Division is responsible for the manuals, but no policy has yet been formulated and it would appear better to have a wider editorial group as suggested.

The recommendations are set out in more specific form below:

1. A new series of FAO Fisheries Manuals should be started. They should have a slightly different general title to distinguish them from the discontinued FAO Manuals in Fisheries Science.

2. There should be six manuals covering resource research and management along the lines set out at the start of Section 5, with additional manuals on Aquatic Environment Research Methods and Aquaculture.

3. There should be an editorial group formed of Headquarters staff and research workers in advanced and developing countries for the planning of an integrated series of manuals to ensure that they meet the needs of developing countries and are up-dated when required.

4. All manuals should be available in English and every attempt should be made to publish them also in French and Spanish as soon as possible.

5. Manuals should be prepared as manuals and presented only in that series, although they will often draw heavily on material previously published in the Technical Papers series. Provisional or limited circulation versions should also be in the manual series.

6. Manuals need to be written with their use by scientists in developing tropical countries kept clearly in mind. Also not all users will be reading them in their mother tongue, even when they are available in all the UN languages. Therefore, while they must retain the highest scientific quality, they should be written with the minimum of jargon and use at least half of the examples from tropical and sub-tropical areas.

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